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McParland Finn
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Editorial

Agriculture and the environment- where to next?

I remember back in my agricultural student days at Harper Adams Agricultural College, when you could study only agriculture at Harper, and reading a new book *A Study in Compromise* edited by Derek Barber and published by the RSPB (1970). This was a report from a conference held at the old Silsoe College where farmers and conservationists came together for the first time to consider the question of how they each perceived agriculture and the environment. Looking back it is clear that from this conference the likes of the Farming and Wildlife Advisory Group (FWAG), Environmentally Sensitive Areas (ESA), Countryside Stewardship (CSS) and ultimately Environmental Stewardship (ELS/HLS), has flowed. This edition of *In Practice* highlights a number of examples of how knowledge and practice has moved on since this conference.

The conference was based on the Farmers Weekly farm at Tring. The farm at this time was a mixed farm of 160 ha with 60 dairy cows, 200 ewes and a range of arable crops. The aim of the conference was to consider how various intensive specialised agricultural changes might increase agricultural profit over the mixed farming system. The unique aspect of the conference was to then evaluate these agricultural scenarios for their environmental impact. The environmental assessment was undertaken by Dr Norman Moore of the Nature Conservancy Council. Only the farm environmental scenario was thought to lead to increases in environmental benefits achieved by the mixed farm. This group was led by Nigel Gray of the Game Conservancy (Game and Wildlife Trust). Their basic improvement included woodland plantings, corner copses and hedge management including basic grass margins, all options that now form part of Environmental Stewardship type agreements. His overall assessment of all scenarios was *"the main conclusion I would draw from these figures is that if you leave the best habitats and the boundary hedges you can make quite ruthless alterations to the internal hedges without seriously affecting the wildlife"*. I am not sure such a similar conclusion would be made today after 40 years of further ecological experience and research.

The science and understanding of the importance of agricultural habitats has moved on since this conference and for me environment and agriculture are two sides of the same coin. However, they have become separated and the last 40 years have been about putting the coin back together. The new thinking on ecosystem services, catchment plans/landscape working and sustainable agriculture are the new mechanisms to address the environmental-agricultural conflicts highlighted by the conference. Recent work by Dr Robert Shiel of Newcastle University has demonstrated that if you re-evaluate the old Norfolk four course rotation (mixed farming) in relation to resource transfer of nutrients/ weed control then the most profitable crop becomes the least profitable and the worst the most profitable.

From this one can conclude that mixed farming does pay. For me this turns all the agricultural changes proposed at the conference on its head in that the environmental value of the mixed farm is not lost to the agricultural specialisation and intensification scenarios, which were proposed as the only way to maintain a profitable farm. The environmental evidence base now shows that the best biodiversity and species are found in such mixed farming systems.

The views expressed in this editorial are those of the author and not necessarily those of his employer, Natural England.

Steve Pullan CEnv FIEEM
Team Leader - Land and Conservation, Natural England

CONTENTS

Cover image: Collection of agri-environment images

Photography: Pete Johnstone CEnv MIEEM

Artwork on the cover will normally illustrate an article in, or the theme of, the current issue. The Editor would be pleased to consider any such material from authors.

Delivering Environmental Objectives with the Environmental Stewardship Scheme in England

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The report to Government, *Making Space for Nature: a review of England's wildlife sites and ecological network*, led by Professor John Lawton, re-affirmed the vital role that agri-environment schemes play in meeting environmental objectives. The main agri-environment scheme in England, Environmental Stewardship (ES) was launched in 2005. There are now 40,000 ES agreements with farmers who manage over six million hectares of land. The benefits to biodiversity, landscape and access to the natural environment are huge. However monitoring and evaluation of the effectiveness of ES has highlighted areas for improvement, most notably the pattern of option uptake within Entry Level Stewardship, and there is growing evidence of the need for targeting particular suites of ES land management options at the farm and landscape scale.

Natural England and our partners are developing new services to assist farmers and their advisers make better use of ES to achieve environmental objectives.

The Ecological Argument for Environmental Stewardship

The *Making Space for Nature* Report recommends the establishment of ecological networks to achieve the following:

1. To restore species and habitats appropriate to England's physical and geographical context to sustainable levels.
2. To restore and secure the long-term sustainability of the ecological and physical processes that underpin ecosystems and the services they provide.
3. To provide accessible natural environments rich in wildlife for people to enjoy and experience.

Environmental Stewardship is well placed to help deliver these objectives both through supporting the management and restoration of high value wildlife sites and by improving the connections between these sites in the wider environment. The Lawton Report demonstrates that the most effective approach to achieving these objectives is to improve the quality of existing wildlife sites and reduce the pressures on them by enhancing the wider environment. This article focuses on the second part of this strategy. With around 70% of all farmed land in England now in ES, farmers are becoming accustomed to managing land for environmental objectives. The three Entry Level strands; Entry Level Stewardship (ELS), Organic Entry Level Stewardship (OELS), and the new – Uplands ELS (UELS), together with targeted Higher Level Stewardship (HLS) agreements can enhance the wider environment.

Online Advice and Training

Environmental advisers play a key role with the selection of ES options for their farmer clients entering the scheme. Advisers also provide invaluable technical advice for farmers in ES on how best to deliver land management options. A webpage dedicated to agents has recently been set up on Natural England's website to provide advisers with a range of resources to help make the best choices for environmental objectives on their client's farm. There is also an online agent's register which advisers can sign up to, to offer their services to farmers seeking support with scheme advice and application.

Farmers Take Up the Environmental Challenge

The Campaign for the Farmed Environment (CFE) is a voluntary, industry-led initiative launched in November 2009, which seeks to retain the environmental benefits provided by former set-aside land. The Campaign has been a major driver for farmers to renew their ELS agreements and consider the options they choose to maximise environmental benefit of their farm. Many farmers would prefer to continue receiving £30 per hectare per annum for five years for a voluntary environmental scheme, with options picked to suit their circumstances, rather than be forced into compulsory regulation in years to come.

CFE has brought together organisations such as the National Farmers Union, the Country, Land and Business Association, the Farming and Wildlife Advisory Group, and Defra and its agencies including Natural England. The Campaign objectives are organised under three key themes; resource protection, farmland birds and farm wildlife. CFE has also highlighted the need for more in-field options such as wild bird seed mixture and for farmers to record their voluntary environmental work taken on farms (see leaflet opposite).

Ecologists Provide the Technical Support

In 2010 Natural England launched a new programme of training, information and technical support for farmers in the three Entry Level strands of Environmental

Farming for farm wildlife leaflet depicting ES options (the full size leaflet is available at http://naturalengland.etraderstores.com/NaturalEnglandShop/NE231)

Stewardship. This programme is designed to improve the environmental benefits of the schemes by providing farmers with the skills and knowledge to empower and encourage them to choose ELS options that address a particular environmental objective(s). Natural England specialists identified the ELS land management options which provide maximum benefit for farm wildlife, farmland birds, soil and water protection, the historic environment and landscape. Farmers are offered a one to one visit by environmental advisers and group workshops to help them choose the best options for their farms.

Natural England has established what coverage of the key ELS options we should aspire to have in place nationally – these are known as ELS Indicators of Success (IoS). ELS agreements are monitored to assess progress towards these indicators and to identify what impact the training and information programme may be having on option selection. Preliminary analysis of data at this early stage indicates that there has been a moderate positive shift towards the priority options (see Figure 1 below). However, the assessment of the impact of training and information is complicated by the inability to characterise a control group not influenced by wider advisory/training actions.

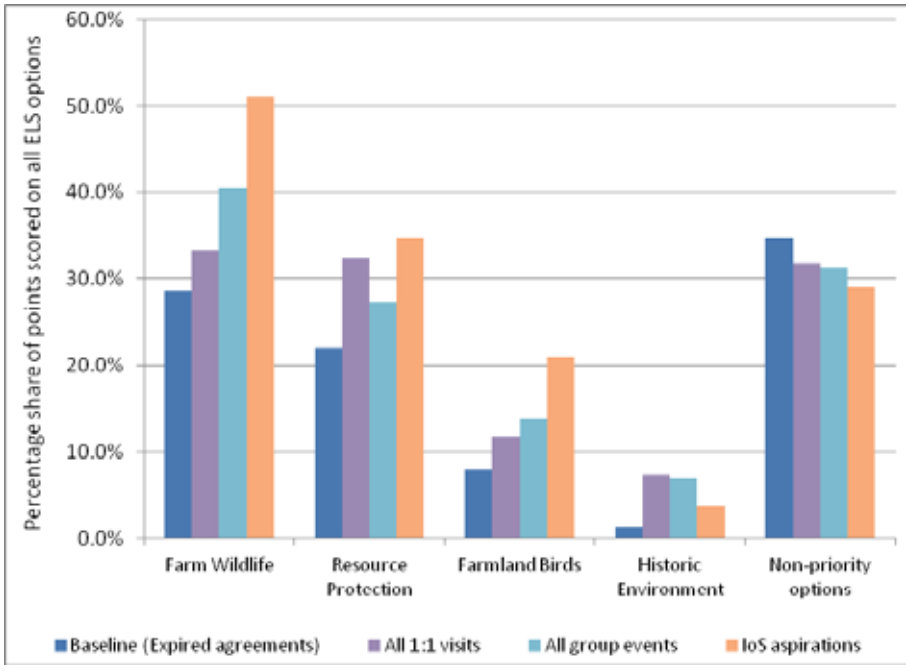
Keeping it Local

The key ELS option approach has enabled prioritisation of ELS options at a local level. Maps are available on the agent's webpage which shows where these options are most appropriate within each region. For each region there are individual maps showing the priority areas for: farmland birds; arable plants; butterflies, bees and vulnerable grassland; water voles, dragonflies, newts and toads; bats and dormice, and; priority areas for cleaner water to help deliver the Water Framework Directive targets. There are also tables identifying the priority archaeological sites. These maps and tables are available on the website.

The high priority areas for farmland birds and wildlife are located where there are stronger populations of the species and the agricultural land use is more likely to respond to the use of ELS options. For example, the east coast of England (Map 1, next page) is a high priority area for farmland birds as it is mainly arable, and has hotspots of the six scarce arable specialists: grey partridge, lapwing, turtle dove, yellow wagtail, tree sparrow and corn bunting. In this area we want farmers to consider putting in a combination of priority options which will provide in-field nesting habitat, seed food during the winter and early spring and insect-rich foraging habitats. Such options include extended over-wintered stubbles, wild bird seed mixtures and nectar mixtures.

For arable plants, such as Venus's looking glass, night flowering catchfly and weasel snout, the band of calcareous soils that run from Dorset Downs and Cranborne Chase to Breckland are a high priority. The light free-draining soils in these areas often support populations of rare species and provide the best opportunities to help arable plants. Farmers can help rarer arable plants by using options such as un-cropped cultivated margins.

River catchments and areas which are failing or at risk of failing the Water Framework Directive standards are the priority for options to protect soil and water. The options which can be used to improve the quality surface water, groundwater, bathing and shellfish waters are listed. For example, Somerset, Dorset and Devon contain large areas of failing ground waters where using winter cover crops would be particularly beneficial (Map 3).



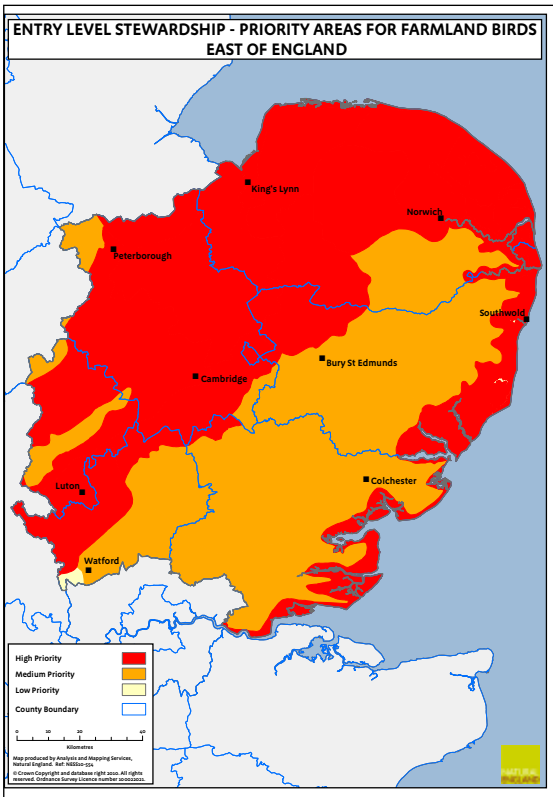
ELS Renewal Applications: Distribution of points between ELS objectives Note: The sum of each category is greater than 100% as some options appear in more than one category

ELS Online Applications

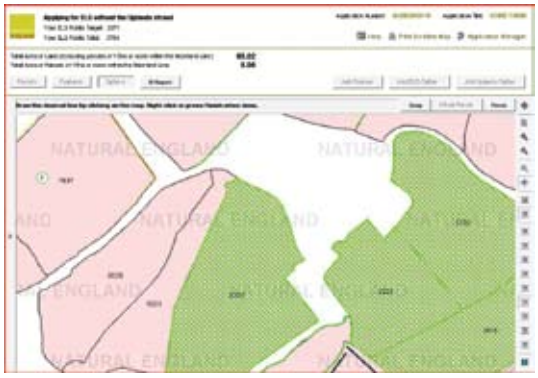
The introduction of online applications has been a major improvement to ELS over the last few years. The online software has its own measuring tool which saves time and cost by measuring hedgerows, buffer strips and other farm features on the computer as opposed to out in the field. Points are also calculated as you add or subtract features/options and there is the function to review, amend and save documents. Most agents believe it can cut five days from the entire application process and save on postage time and expense. The online software has proved extremely popular with agents and farmers for both renewing ELS and applying for ELS schemes (see screenshot on next page).

Environmental Stewardship in Action at the Farm Scale

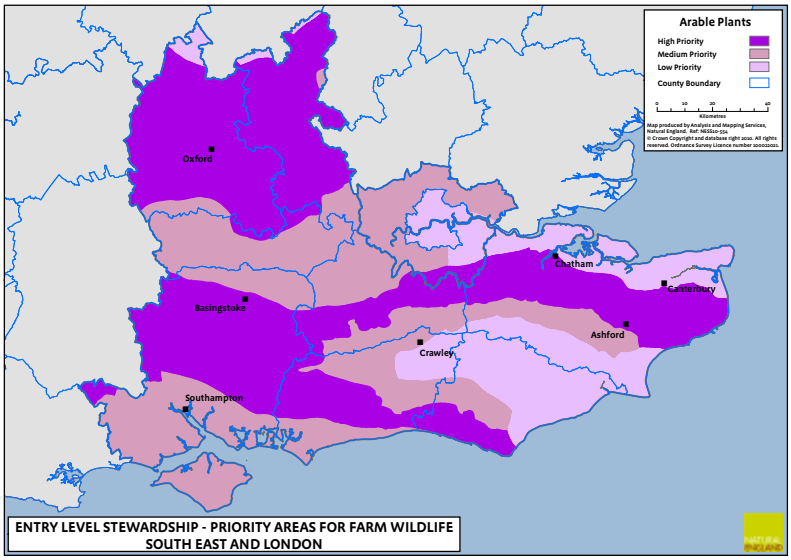
The 1,590 hectare Norfolk Estate in Arundel, West Sussex is a good case study of the potential for Environmental Stewardship to deliver benefits for biodiversity. The four farms on the Estate



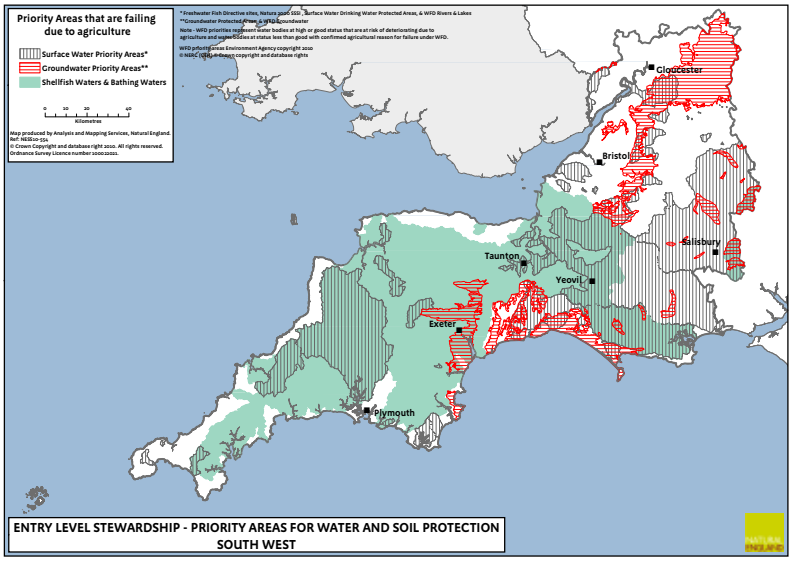
Map 1. Entry Level Stewardship - Priority Areas for Farmland Birds - East of England



Online software with measuring tool



Map 2. Entry Level Stewardship - Priority Areas for Farm Wildlife - South East and London



Map 3. Entry Level Stewardship - Priority Areas for Water and Soil Protection - South West

are a diverse mix of arable and grassland. The land across the farms had large fields to suit farm mechanisation, hedges and margins had been removed and some areas of historic value had been cultivated and archaeology lost or ignored. Previously in environmental management since 2003 they were all entered into one HLS agreement in 2007 (comprising ELS and HLS options) which has provided greater scope for grassland and arable management and more tailored to the Estate's needs.

By blending conservation with a profitable food producing business, one of the Estate's aims is to recover farmland bird populations to pre-1996 levels or better, with a particular focus on the grey partridge that was almost extinct on the farm by the early part of this decade. In some areas extra ELS options (going beyond the basic points threshold set for the farm) have been used to make the most of the potential to manage arable land for the benefit of farmland birds.

Options for arable management at the Norfolk Estate:
HE1 buffer strips on cultivated land, 2 m
EF6 Over-wintered stubbles
HF2 Wild bird seed mixture
HF7 beetle banks
EF10 unharvested cereal headlands
HF14 unharvested conservation headlands
HE10 floristically enhanced grass margins (non-rotational)
EG1 undersown spring cereals
HJ4 Arable reversion to grassland with low fertiliser input to prevent erosion or run-off

Options for grassland management and protection of historic features have also been used to create a diverse and multi-objective agreement.

In some cases the Estate has gone beyond the regular HLS prescriptions and are experimenting to see whether sowing headlands with wider drill spacing to leave more room for arable wild flowers to flourish, will encourage greater numbers of wildflower and insects - staple food for farmland birds. Next to the headlands, strips of wild bird seed mix (HF2) and beetle banks (HF7) provide a variety of food sources and cover for birds, insects and small mammals, whilst the main crop area remains conventionally managed.

The Estate has the added bonus of ecologist Dr Dick Potts monitoring wildlife levels in detail each year since 2003. Dick assesses breeding bird numbers annually from mid-March to mid-July, with game birds monitored separately in spring and after harvest. Surveys of arable weeds and insects are also carried out annually. Neighbouring farms with no agri-environment options on them are monitored to provide a control.

Initial results from monitoring have been highly encouraging. Grey partridge and skylark have responded best to the agri-environment measures, especially the in-field habitat improvements provided by beetle banks and hedging, seed mixes and unsprayed headlands, and have done so similarly across all four of the Estate's farms (see graphs to the right).

Other farm birds such as corn bunting, lapwing and yellowhammer have shown less dramatic responses but the overall trend is for improvement. Overall, Dr Dick Potts estimates that 26 more 'pairs' of birds have arrived per square kilometre (100 ha) per year as a result of agri-environment measures and associated management. Mammal species have benefited as well, notably brown hare, which has shown year-on-year increases. Raptor and owl numbers are up, partly it is thought in response to greater numbers of voles living on the beetle banks and margins.

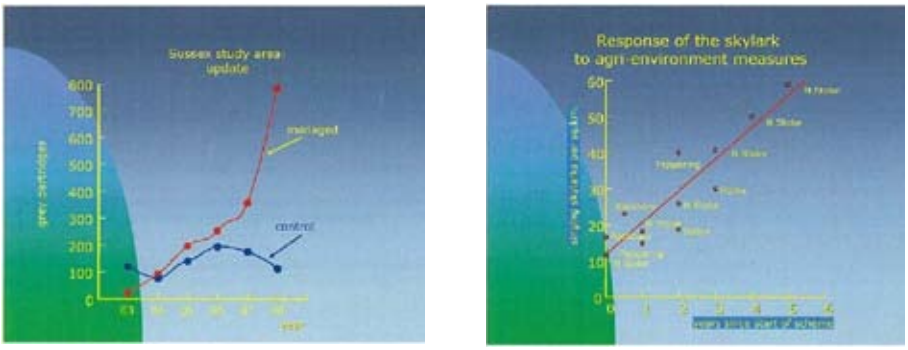
Arable wildflowers and associated insects have responded well in the unsprayed conservation headlands. In surveys of conservation headlands (EF10 and HF9) the bug *Calocoris norvegicus*, a highly sought after food of grey partridge chicks, responded very well, increasing the survival of chicks. In 2008, grey partridge breeding success was the highest recorded for 55 years on the Sussex Downs.

Environmental Stewardship in Action at the Regional Scale

The South West Farmland Bird Initiative (SWFBI) is a four-year Natural England-led partnership which seeks to help reverse the decline in farmland birds across Wessex. Beginning in April 2008, the initiative targets nationally recognised farmland bird hotspots across Gloucestershire, Wiltshire and Dorset as defined by the distribution of the six fastest declining farmland birds in England, often called the 'Arable Six': grey partridge, lapwing, turtle dove, yellow wagtail, tree sparrow and corn bunting.

By focussing on these six species, the initiative is targeting many of the finest remaining arable habitats in Wessex (see map right), and having much wider benefits for other wildlife associated with arable farmland - in particular, rare arable plants like shepherd's needle, brown hare and the more widespread declining farmland bird species like skylark, linnet, reed bunting and yellowhammer.

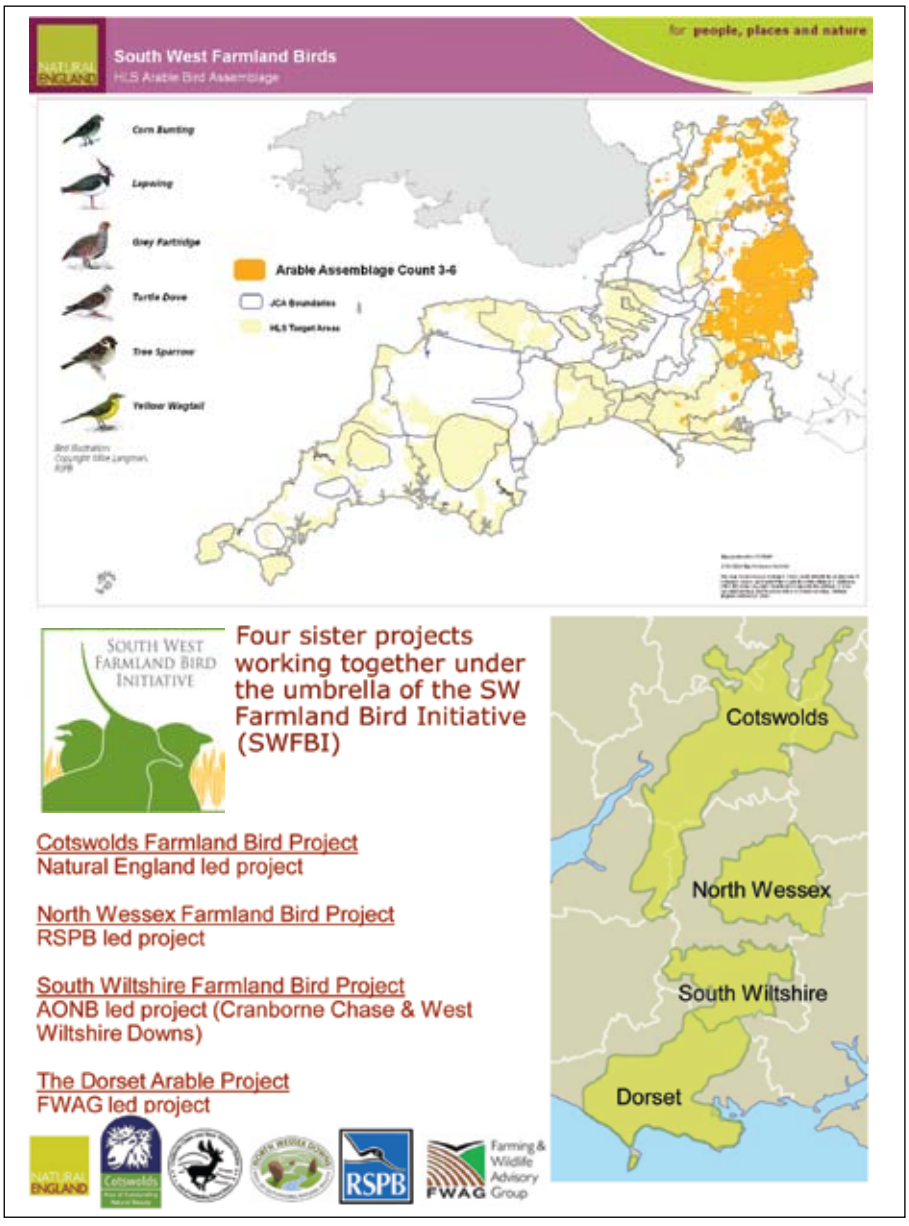
Partnership is key to the approach and SWFBI has brought together a mix of national and local organisations and farmers, bringing together the best



Grey Partridge (2008) (left) and Skylark (2008) monitoring (right) (Graphs courtesy of Dick Potts and the Duke of Norfolk's Estate)

expertise, knowledge and established farmer networks to deliver in the identified project areas (see map below). Across the three counties, four sister projects are operating together under the SWFBI umbrella. Each is led by a different partner organisation which employs a dedicated project officer to give practical advice to farmers on how they can best use the Environmental Stewardship (ES) scheme to help farmland birds and the other animals and plants associated with arable landscapes.

At the start, the SWFBI partners consulted farmers in each area to establish how interested they were in helping to conserve the 'Arable Six'. The majority of farmers were enthused by the approach but needed specific farm-based advice from the partners on what was needed for farmland birds. The SWFBI partners have responded to this customer need by



developing an evidence-based ES package of in-field options that delivers the most important habitats for farmland birds. The package focuses on those in-field options that deliver the maximum benefit for farmland birds with a 'fixed list' approach to delivering ES options which provide the critical resources that farmland birds need to survive and breed successfully, *i.e.* over-winter seed food, spring/summer invertebrate food and places to nest in-field. The mix of ES options was formulated using the best research, evidence and experience to date from RSPB, GWCT, BTO and Natural England. The evidence all pointed to a need for a minimum of 4-7% of a 1 km-square to contain suitable in-field management to deliver enough key habitats to help reverse the decline of farmland birds.

ELS and HLS Farmland Bird Packages

The packages in the table below are at the heart of SWFBIs activities with the four projects working across the Wessex area to deliver a comprehensive programme of free tailored advice, one to one farm visits and workshops. All the projects deliver the same message and same ask of the farming community, ensuring that the options are sited correctly for the needs of the farmland bird species that the Initiative is targeting. Having an evidence-based figure to work to at the farm-level has been very well received by the farming community and has made the approach easier to 'sell', with many farmers actually now delivering more than the minimum 7% ask within their HLS agreements. The farming community has also responded very positively to the way partner organisations are working together to deliver the same consistent message.

Since its start in October 2008 to January 2011, the initiative (across the four project areas) has engaged with the farming community at the landscape scale, delivering:

- Total Ha of farmland advised on: 113,414ha
- Number of 1:1 farm visits carried out: 401
- Number of farm workshops/events run: 53
- Number of Farmers/Agronomists/others attending workshops: 1,129
- Total 'Live' Ha of key in-field ES (ELS/HLS) Farmland Bird Options delivered on the ground: 3,847ha
- Total 'Live' £ spend on key in-field ES Farmland Bird Options delivered on the ground: £11,645,533

How are the actual farmland birds responding? It is early days to assess the impact of SWFBI but there are some promising signs. Five pairs of corn bunting are now breeding (in 2009 and 2010) on one of the SWFBI farms in the Cotswolds, where they have not bred before. In December 2010, in Dorset, Wiltshire and Gloucestershire, many farmland birds were recorded during the cold spell using the wild bird mix plots and stubble options put in place – with flocks of 300 corn bunting, 2,000 skylark, 1,000 linnet and 250 yellowhammer recorded from three of the key farms. Monitoring is now in place at 35 farms across southern England for the next five years to assess just how well the SWFBI approach has contributed to reversing the decline of farmland birds using the evidence-based ES farmland bird package.

The SWFBI targeting and delivery approach has now been adopted across England as a way to deliver for farmland birds in arable/mixed landscapes using ES as the key delivery tool. Many areas have local farmland bird projects or initiatives in place - with all of these delivering the same consistent message and ask of the farming community across England for farmland birds. The approach has also influenced the way the CFE has been developed with the ELS farmland bird package now central to CFE activity and delivery on the ground.

The initiatives on the Arundel Estate and by the South West Farmland Bird Initiative both demonstrate how Environmental Stewardship can begin to realise the Lawton Report's call for ecological networks that restore species and habitats to sustainable levels. Ecologists are playing key roles in the success of these case studies and the development of new ES support services by Natural England and our partners. The emerging formula for success is to tailor the approach so that it fits farmers' wants and needs as well as achieving environmental objectives. The challenge ahead is to develop a flexible Environmental Stewardship scheme that serves both farmers and the natural environment well.

Further Reading

Lawton JH *et al.* (2010) *Making Space for Nature: A review of England's Wildlife Sites and Ecological Network* report to Defra.

Natural England (2009) *Agri-environment schemes in England 2009. A review of results and effectiveness*. Natural England Research Report 194.

Potts GR (2008) *Restoring biodiversity to the Norfolk Estate, Arundel. Year 6: 2008. A report for the Norfolk Estate.* (Unpublished).

Walker KJ, Critchley CNR, Sherwood AJ, Large R, Nuttall P, Hulmes S, Rose R and Mountford JO (2007) The conservation of arable plants on cereal field margins: an assessment of new agri-environment scheme options in England, UK. *Biological Conservation* **136:** 260–270.

Useful Websites

http://www.naturalengland.org.uk/ourwork/farming/funding/es/agents/elsoptions/

http://www.naturalengland.org.uk/ourwork/farming/funding/es/agents/register.aspx

http://www.naturalengland.org.uk/ourwork/farming/funding/es/agents/elsoptions/farm-wildife.aspx

http://www.cfeonline.org.uk/

Correspondence: Caroline.Maddock@naturalengland.org.uk

Resource	ES options	ELS (minimum per 100 ha)	HLS (minimum per 100 ha)
Winter seed food	Wild bird seed mixture or Weed-rich stubble (or a combination)	2 ha or 5-10 ha	2 ha or 5-10 ha
Spring-summer invertebrate food	Conservation headlands, low input spring cereals, field corners, beetle banks, blocks/strips of nectar mix/flower-rich margins	1 ha	2-3 ha
Places to nest in-field	Skylark plots Fallow plots	20 or 1 ha	20 *plus* 2 ha (if appropriate)

ELS and HLS Farmland Bird Packages

Ecology and Agri-Environment

Chloe Palmer MIEEM
Director, FWAG and Nuffield Scholar

The Farming and Wildlife Advisory Group

The Farming and Wildlife Advisory Group (FWAG) is a registered charity founded by a group of farmers and conservationists in 1969. FWAG was established to promote sustainable farming methods and to demonstrate that wildlife can be encouraged alongside a profitable farming enterprise. This premise is still the central principal behind FWAG's activity today. We remain farmer-led, with active farming committees in most counties and with a strong farmer membership of nearly 10,000 farmer members and supporters. Our links with conservation are also strong as we play an active part in many Local Biodiversity Action Plan Forums as well as working closely with the RSPB and other conservation charities.

FWAG prepares more Higher Level Scheme (HLS) applications and Farm Environment Plans (FEP) than any other single organisation in England and we were therefore keen to contribute to this *In Practice* discussion about ecology and agri-environment schemes. This article reflects the viewpoint of our Farm Conservation Advisers who are giving advice to over 5,000 farmers on agri-environment schemes each year but also from the farmers themselves who we deal with on a daily basis.

The views expressed in this article are based primarily on the Environmental Stewardship Scheme and the English 'classic schemes', that is, the Countryside Stewardship Scheme and the Environmentally Sensitive Area Scheme. Specific reference will not be made to the schemes in Wales (currently 'Glastir') and Scotland (Land Management Options under the Scottish Rural Development Plan). However, many of the general observations made in this article are equally applicable to the Welsh and Scottish schemes.

There has been considerable criticism from several prominent conservation groups that agri-environment schemes in the UK are not achieving enough for nature conservation, and in particular, those species that are in decline. These comments are based primarily on scientific survey results, occasionally as a result of personal observations and sometimes in response to specific research papers.

There is no doubt that there is scope for more 'value' to be delivered from agri-environment schemes, the difficulty is always in relation to how this can be achieved on the ground. Farmers have to balance making a difference for the environment with the constraints of making a living off the land. As price support has gradually been phased out of the Common Agricultural Policy, farmers face a hugely volatile market for their products. Farmers need to retain as much flexibility as possible so that their businesses can respond to these price fluctuations. This affects option uptake within Entry Level Stewardship (ELS), as they will choose those options that allow them the necessary room for manoeuvre, in favour of those options that give them the scope to respond to weather events, price changes, input cost rises and market demand.

Ecological Input at Every Stage

Primarily, sound ecological principles must be at the heart of each scheme at every stage if this increased value is to be accrued for the benefit of species, habitats and the wider farmland landscape. So, it is essential that the FEP is prepared by an adviser with a good ecological understanding so that they are able to recognise and assess a wide range of species and habitats. It is also important that the adviser has a good knowledge of the natural history of the surrounding area so that they can relate their findings to the local context. They should also have a practical knowledge of resource protection, particularly in relation to watercourses and soil management. This will enable them to identify potential adverse environmental impacts from farm operations and then select scheme prescriptions that will minimise or preferably even eliminate these environmental risks.

The Farm Adviser must be able to interpret the findings of their FEP Survey so that this can be used to prepare a first class application that takes account of the key features found on the farm and their environmental potential. In order to achieve this, a thorough knowledge of the agri-environment scheme options is essential, but this must be coupled with an in-depth understanding of how they should be implemented and managed on the farm in perpetuity.

The adviser must be able to consider how the agri-environment scheme application for this farm will relate to surrounding holdings and the ecological interest found there. Landscape scale conservation is the current terminology used to describe this process. It is something that FWAG has been doing for over four decades,

Farmers at a farm walk hearing about margin management and the role of margins in effective biological pest control at a FWAG Weed Control Demonstration Day

Geoff Eyre, heather restoration expert, explaining how to restore heather moorland on degraded sites that have suffered from over-grazing at a FWAG farm walk

as no single farm holding should be considered in isolation. Wildlife does not respect ownership boundaries!

Once the farmer has his/her agreement and begins to implement the prescriptions, it is vital that ecological input to the scheme continues. As far as possible, FWAG attempts to maintain a working relationship with the farmer throughout the lifetime of the agreement. This is achieved principally through FWAG's farmer membership scheme. As a member of FWAG, farmers will receive invitations to a range of farm walks, evening talks and presentations, technical briefings and 'FWAG Forums' as well as its regular newsletters and e-bulletins. Members also receive free telephone advice and we receive regular calls about topics such as establishing wild bird seed mixes, managing field margins, hedgerow establishment and so on. We believe this follow up service is essential if agri-environment schemes are to make a real difference for wildlife.

Engaging the Farmer

FWAG has always believed that the adviser has another vital role, and that is to enthuse the farmer about what they have on their farm and what they could have if they embrace the agreed options that will form part of their scheme. Contrary to popular opinion, many farmers are innately passionate about wildlife and conservation and also are extremely knowledgeable about natural history. They may not know the names for everything, but they know where it grows or lives and what it needs to thrive. Those farmers that do not show these characteristics during an initial visit are very often persuaded and quickly stimulated by what they are shown or learn about. The best ecologist will not achieve the best result on a farm for conservation without the ability to inspire the farmer.

Defra undertakes some monitoring of existing agri-environment schemes in order to measure the conservation gain from the individual agreements. FWAG is keen that ecological monitoring becomes more widespread in order that the value of agri-environment schemes can be more accurately measured. The best way to achieve this cost effectively would be to approach the agreement holders to undertake the monitoring themselves. This would have several benefits:

- the farmers would see for themselves the difference that their conservation work was making for a selection of indicator species and thus would further inspire them to do more;
- it would be cost effective across a large number of farms; and
- regular monitoring could enable the agreements to be tweaked in response to success or disappointing results rather than waiting for the end of the agreement (usually 10 years) before making significant changes.

An excellent monitoring tool is available for use by farmers in the form of LEAF's (Linking Environment and Farming) 'Green Box'. Professional ecologists may argue that this is not as scientific as standard Phase 1 and Phase 2 survey techniques and this is clearly true. However, there are not the funds available to pay for professionally completed surveys of large numbers of farms and therefore the use of the Green Box approach would serve as an excellent compromise. Furthermore, by engaging farmers, land owners and land managers to do this would create a far more trusting relationship as they would have ownership of the results.

Learning from the Past…

The existence of the Public Service Agreement (PSA) targets prior to the change of Government led to a disproportionate focus on farmland birds while other species were seemingly ignored by many within Government Agencies. There is a clear argument that farmland birds are the litmus test for the health of all habitats and species. However, channelling all efforts into conserving a list of top 20 species can be counterproductive.

Farmers that have good ecological understanding often do not relate to a target driven approach when seeking conservation success on their farms. Rather, they compare what they see on their farm on a day to day basis with a sub-conscious baseline which will relate to a point in time depending on their age. Often these farmers will view the pursuit of a threshold number of a limited suite of species as 'dumbing down'. They recognise the complexity of all ecosystems and the factors that influence their survival or otherwise. Ecologists should seek to encourage this holistic attitude, rather than try to categorise their efforts into 'unfavourable, recovering' or recognise only those species that appear on their lists.

It is also vital that Government Departments and Agencies, NGOs and all other organisations that influence policy in relation to agri-environment schemes and the farmland environment recognise all the factors at play in determining whether or not a scheme is successful in achieving its aims.

A recent article in the October edition of *British Wildlife* by prominent farmer, conservationist and founder member of FWAG, Philip Merricks, highlighted the impact of predation on lapwing numbers on his farm at Romney Marsh. In fact, many farmers are acutely aware of the effect of predators because they observe their actions every day. If ecologists wish to maintain their credibility amongst practitioners, they must acknowledge that predation is a serious problem in many parts of the country that needs to be addressed, albeit legally and humanely, if scheme options for ground nesting birds are to be successful in terms of maintaining and hopefully increasing population numbers.

FWAG advisers, research scientists at the Game and Wildlife Conservation Trust (GWCT) and many other amateur naturalists are all in agreement about the role that predation has in limiting the breeding success of many ground nesting birds and waders. These birds are the target species for many agri-environment options, particularly in the Higher Level Scheme. They have precise

Farmers discussing the management of low input grassland and scrub control at FWAG Best Practice Event

habitat requirements but they are also particularly susceptible to predation. Other research projects, notably the Otterburn project, managed by GWCT have backed up the findings from Romney Marsh.

There is no doubt that the decline in habitat quality and the fragmentation of many valuable habitats has made many wildlife species far more susceptible to extreme climatic events and other pressures. For example, the extreme weather conditions that have prevailed in the UK during recent years have nevertheless had drastic effects on the populations of certain species. Cool, wet summers have affected the survival of a wide range of invertebrate species, especially butterflies and moths. The very cold winters both last year and this are known to have caused large increases in mortality rates in bird and mammal populations.

The science of agri-environment schemes and their constituent options is still relatively new. GWCT has been instrumental in researching the effectiveness of a range of options at their Allerton Project at Loddington in Leicestershire. Recent research has focused on resource protection, particularly soil management, as well as species-specific studies and a wider research project looking at the impact of positive game management on biodiversity. Detailed species surveys across the estate have been completed every year since 1992 and these have contributed to one of the most comprehensive landscape scale ecological experiments in the UK.

Looking to the Future…

Sound ecological science must form the basis of future agri-environment options and the prescriptions that define them. However, this must be coupled with farm-based research to investigate whether they are practical at the farm level. Even farmers that would describe themselves as dedicated conservationists are unlikely to favour options that are difficult to establish or require significant management input during busy times of the year. On a positive note, many of the resource protection prescriptions that GWCT are refining at Loddington also deliver significant benefits in terms of resource efficiency. For example, options that promote soil health will also facilitate more efficient nutrient uptake, thus reducing fertiliser bills. With fertiliser prices predicted to reach an all time high in 2011, this is an attractive prospect for any farmer.

Soil management demonstration day – farmers learning about how to diagnose different soil conditions in order that management prescriptions and cultivation methods can be fine tuned accordingly

It is also essential that the advisers who are guiding the farmers are able to give up to date information about the predicted income foregone figures for implementing a particular option in a specific location and covering an estimated area. By giving the farmer accurate data in order that he/she is able to make an informed choice, he/she is more likely to choose the right options and sign up to an agreement that will make long-term sense for him/her even if there are increases in commodity and livestock prices. Furthermore, if the farmer can see that the farm business is not suffering unduly as a result of the schemes, he/she is more likely to do more for wildlife and the environment if and when his/her agreement is up for renewal.

The current policy framework indicates that achieving substantial environmental gain on farmland will be essential if 'a coherent and resilient ecological network' is to be established. Lawton's *Making Space for Nature* report (September 2010) states that networks of wildlife habitat to link National Nature Reserves, SSSIs and local wildlife sites will be critical to the survival of our most important ecological resources. Furthermore, these 'core areas' will need to be buffered by suitably robust habitats to prevent further degradation.

To achieve the principal aims of the Lawton report, it will be essential to work closely with farmers and their advisers in order to utilise appropriately located and managed agri-environment scheme options. This joined up approach will require strategic ecological planning at a national and local level.

It will also necessitate policy-makers and farm advisers to consider how improved environmental value can be gained from ELS as this is often overlooked when considering specific conservation outcomes. For example, many of the options in ELS are appropriate for buffering such sensitive wetland or woodland sites, as long as they are suitably located. Similarly, the low input grassland options would also be useful when seeking a means of buffering or even extending valuable grassland sites. For this to be effective, it is vital that the advice given to farmers and landowners is based on ecological principles. A significant number of ELS schemes are currently prepared by agents who have little or no ecological understanding and will therefore seek to achieve the points target with little thought to the long-term environmental benefits that the scheme will deliver. Is this right to achieve the best outcomes?

In summary, agri-environment schemes offer huge potential for achieving robust habitats at a landscape scale that have value for a variety of wildlife including many of our declining species. For the full potential of agri-environment agreements to be realised, it is vital that the farmer receives advice based on sound ecological principles from an adviser with the experience and knowledge to fully understand both the farming implications and the likely environmental outcomes of the proposed scheme. Only this will achieve the benefits for fauna and flora that we are all agreed that we would like to see now and in the future.

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Catchment-Scale Flood Storage and Wetland Restoration:

A Programme of Rural Works in Northumberland

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Through the Environment Agency's Local Levy funding, we have developed a programme of projects that work with natural processes such as tidal inundation and overland flow paths, to address flooding and restore habitats such as saltmarsh. Many of these projects deliver multiple benefits such as reducing the risk of flooding, restoring or creating habitats and improving water quality. Working with land managers to achieve this has been paramount to the success of the projects and highlights the opportunities to improve areas of agricultural land while ensuring 'business as usual' for farmers.

Need and Opportunity

In rural Northumberland, the post war drive for farming efficiency led to the creation or upgrading of many rural and coastal floodbanks as well as improving field drainage. The Environment Agency (and its precursors) have managed and maintained these defences for the last 60 years.

This situation has now changed due to a number of factors. These are:

- Changes in Government thinking about flood risk management (as outlined in *Making Space for Water*), funding reductions and a shift towards protecting built property and assets.
- Changes in agri-environment incentives to support environmental improvements and an enlightened farming community willing to engage with Higher Level Stewardship schemes.
- Requirements from the Water Framework Directive to achieve Good Ecological Status/Potential of water bodies, and to deliver Biodiversity Action Plan Targets.

In 2003, the Environment Agency and Natural England set up a small working group to assess the feasibility of landscape-scale habitat creation and restoration projects based around the removal of flood defences, both inland and on the coast. The proposal to remove sections of floodbank was seen as controversial by the local farming communities. We engaged the Farming and Wildlife Advisory Group (FWAG) to float the idea with landowners and farmers in the area and the positive response from partners and the farming community provided the momentum for the programme.

Case Studies

These are examples of work carried out under the Environment Agency's Local Levy programme. They demonstrate the diversity of work within the programme and the common goals of managing flooding while sustainably increasing the scope for wildlife within a productive farmed environment.

Restoring Floodplain Wetlands

The River Till Wetland Restoration Project (RTWRP) is led by the Tweed Forum, and has worked with farmers and land managers to find a sustainable approach to flood management by returning land to the natural floodplain, changing management practices and allowing the development of wetland habitats.

The Till Project's first major scheme was on three farms in the Fenton Floodplains; a system of more than 22 km of floodbanks that have restricted the natural floodplain of the River Till in this area of low lying fertile farmland for the past 60 years. The three farms of West Fenton, Nesbit and North Doddington are located on the northern edge of Milfield Plain, approximately 20 km south of Berwick-upon-Tweed.

Farming practices vary between the three farms. Nesbit has a mixed farming system, with arable crops grown in rotation with grass leys on the gentle slopes below the farm. The low lying fields adjacent to the river and the floodbanks have heavier less free draining soils. The remnants of rigg and furrow, and old drainage networks are clearly seen in these permanent pastures. North Doddington is a large intensive diary farm with the majority of the fields under arable or in short rotation grass leys. West Fenton is predominantly arable, with peas, potatoes, carrots and wheat grown in rotation.

In addition to the traditional farming enterprises, West Fenton Farm also runs the Fenton Centre and Cafe. Opened in 2005, the centre provides an educational and recreational resource on the diversity of life in the countryside, addressing the past, present and implications for the future as well as promoting this project. North Doddington Farm is home to the Doddington Dairy, where artisan cheese and luxury ice-cream are produced by the Maxwell family.

The Project enhanced 150 ha of land by abandoning or breaching 6,700 m of floodbank. This includes 73 ha of new or

New channel at Doddington

restored wetland habitat, the reconnection of 85 ha of active floodplain and 5,700 m of riverbank brought under positive management.

In this intensively farmed part of north Northumberland the wetlands now support a rich assemblage of plants and animals, many of which are rare or threatened. These include waders such as lapwing, snipe, redshank and curlew, wildfowl such as pink foot and greylag geese, widgeon and teal, and mammals such as otter, water vole and water shrew. As the habitats mature and diversify, a wide range of plants, amphibians and insects will also benefit. Fenton Floodplains has now become a major habitat creation and demonstration site and a place of local interest and value.

Below are the case studies from each farm.

Nesbit Farm

On Nesbit, the heavier soils of the floodplain have meant that drainage is poor. Historically the fields have been drained through a three mile network of ditches and foot drains, all flowing into the Fenton Burn via a simple sluice system.

The Till Project developed a plan to open out and re-profile over a mile of ditch and foot drain. We installed a series of sluices in order to manage water across either the whole site, or within discrete cells. We also removed a 200 m section of floodbank to allow flood waters back across the floodplain and to increase habitat diversity by creating a series of small pools and scrapes along the ditch network.

The lawn and tussock nature of the sward and the hydrology on Nesbit lends itself to the development of snipe and redshank habitat and these fields will be managed in the spring and summer to provide optimum breeding conditions for these two wader species. During the winter, the fields will be flooded to provide an area suitable for winter wildfowl such as teal, widgeon and pink footed geese.

North Doddington

On North Doddington, the challenge was to establish a high water table without impacting on the field drains in the surrounding arable fields. During October 2009, we employed the RSPB's Liebrecht ditcher to create 2 km of shallow ditches and a number of scrapes. Then in 2010, using a technique pioneered by the RSPB on Bearney Marshes, we used a wind pump to lift water from a culverted stream into a series of shallow ditches and swales. The benefit of this is in creating a natural series of shallow pools by simply allowing the water to fill low lying parts of the field, rather than undertaking expensive and disruptive earth works to achieve the same result. A simple sluice is used to manage water levels throughout the site.

West Fenton Farm

In February 2008, we removed 450 m of floodbank, to ensure that flood water from the River Till and the minor watercourses could once more spill over the floodplain. We breached the bank in three places, deliberately 'over-sizing' the breaches to reduce the risk of scour and future maintenance costs.

Once the work to the banks was complete, we restructured and re-seeded the arable fields on the landward side of the bank using a more herb rich mix used for marginal slopes.

The heavily modified Fenton Burn forms the boundary between West Fenton and Nesbit. Isolated from the main River Till by a large metal flood gate, the lower reaches of the stream had become an overgrown agricultural ditch. Using a combination of LiDAR (Light Detection and Ranging) mapping and historic maps it was possible to identify the pre-18th century course of the Fenton Burn. The new naturalised channel was created with the help of an American giant, the RSPB's 'Big Wheel' Liebrecht rotary ditch cutter. The efficiency of the ditcher allowed us to complete the work in a week, compared to six weeks for a conventional digger. This reduced the risk of flooding disrupting work. It is the first time this ditcher had been used in Northeast England, and given the frequency of floods in 2008 and 2009, it turned out to be a very prudent choice. The Fenton Burn, instead of flowing within an embanked and straightened channel, now meanders across the newly restored floodplain. This new channel is over 1,400 m in length and connects with a series of existing wetlands, new foot drains and scrapes. As well as providing an enhanced habitat for wildlife, it attenuates flood flow to the river with increased storage, and reduces the silt inputs to the river with areas of deposition within its floodplain.

The main floodplain fields are now managed for breeding waders. The surrounding meadows will be managed for hay or late cut silage followed by aftermath grazing. Elsewhere on West Fenton, we planted 1.2 ha of wet woodland, and a small *Phragmites* reedbed has been created.

Reconnecting Tidal Processes

Northumberland 4shores is an innovative project working to find sustainable approaches to tidal flood defences in rural areas and to restore natural floodplain function. Led by the Environment Agency, the project contributes to sustainable coastal land management, delivers biodiversity conservation targets, and enhances the areas for eco-tourism through recreational and landscape improvements.

The project realigns or removes flood defences, working with natural processes rather than trying to artificially defend against tidal flooding. Instead of protecting marginal farmland, the tide is being allowed to flood pastureland to create wetlands, therefore, flood defence money can be reinvested to protect homes and businesses. This approach is particularly relevant at this time, when agricultural subsidies are being directed away from production towards achieving more environmental objectives.

Northumberland 4shores has contributed to the delivery of priority UK Biodiversity Action Plan (BAP) habitat targets, principally coastal saltmarsh and intertidal mudflat (25 ha) and a mosaic of open water wader scrapes, wet grassland and grazing marsh and reedbed (20 ha). The habitats will benefit wading birds and wildfowl in particular, but also benefit invertebrates, saltmarsh plant communities and mammals such as otter.

Opportunities to create new intertidal habitat on the Northumberland coast are relatively limited due to the local geography and the need to work on privately owned land. Northumberland holds a relatively small amount of estuary land previously reclaimed for agriculture or other uses. Once a suitable site is found, changes to its management are at the discretion of the landowners, so the involvement, co-operation and enthusiasm of the farming and landowning community is crucial to successful project delivery.

Waterside House Farm and Hipsburn Farm, Alnmouth

Northumberland 4shores started work at Waterside House Farm in Alnmouth in September 2006. This work could not have progressed without the incentive to the farmer of the Higher Level Stewardship Scheme (HLS). The farmer receives support for management of the saltmarsh site and other farm elements. The agreement allows him to graze the saltmarsh with cattle, but with much lower stocking levels than previously.

Machine works on the Alnmouth saltmarsh floodbank

We breached two sections of flood embankment over a total distance of 270 m to allow natural tidal processes over 8 ha (20 acres) of pastureland in two fields adjacent to the River Aln estuary. We also created two shallow ponds (scrapes) to hold water at low tide for wading birds and other wildlife. No sooner had these ponds filled with sea water from the high tides in early October, than birds such as black-headed gulls, curlew, teal, swans and eider flocked in! Typical saltmarsh plant communities established on the site within a year, assisted by seeds and plant material washed in from the neighbouring Alnmouth Saltmarsh and Dunes Site of Special Scientific Interest (SSSI). A vegetation survey in 2007 identified a good range of saltmarsh species at the site, including glasswort species *Salicornia*, common saltmarsh grass *Puccinellia maritima*, sea aster *Aster tripolium*, sea purslane *A. portulacoides* and annual seablite *Suaeda maritima*.

In 2008, we created more wetland scrapes and removed a third section of floodbank on Hipsburn Farm, further upstream in the River Aln estuary, resulting in approximately 2 ha coastal saltmarsh, intertidal mudflat, scrape and wet grassland mosaic. In addition, a much larger area of the farm (c.40 ha) is in freshwater wetland, farmland bird and other agri-environment options. We also worked with the farmer at the neighbouring Coquet Estuary at Helsay Farm, Warkworth, to take down farmland flood embankment and create a large, tidal wader scrape surrounded by 0.5 ha mud and saltmarsh habitat.

During informal meetings on site at Alnmouth, local people have commented to the Project Manager on the increasing wetland birdlife they have noticed since the new wetlands were created. British Trust for Ornithology (BTO) monitoring has shown that by 2008 the new wetlands were holding significant numbers of lapwings longer in the Aln estuary. More widgeon and teal were seen using the area, and more oystercatchers were using the site as a high tide roost. Good numbers of common sandpiper and greenshank were often seen. A little egret was regularly spotted using the estuary, and knot, a species not normally associated with the inner estuary, were using the new wetlands regularly.

By Autumn 2010, lapwing numbers had increased to several hundred using the site, and five pairs of lapwing bred at Alnmouth wetlands last year, where there was none before. Numbers of wintering wildfowl have increased and up to 100 oystercatchers have been using the area as a high tide roost. Therefore, early indications are that the new wetlands are attracting a good range of bird species and making quite a difference to numbers and length of time birds spend in the area.

Goswick Farm and Beal Farm, Berwickshire

The main Goswick/Beal site involves an Environment Agency-managed flood bank and sluice on the South Low, Goswick on the mainland adjacent to Lindisfarne National Nature Reserve. We carried out in depth negotiations with landowners and farmers and produced detailed tidal modelling and predictions under different breach scenarios and tidal conditions. Even with the incentive of HLS, not all the farms in the original plan wanted to take part and allow tidal inundation over their land, but the scheme continued with Goswick and Beal Farms.

In 2007, with HLS support, the Beal farmer removed a 15 m section of flood bank, south of the main project site to create approximately 3 ha of saltmarsh adjacent to the Reserve. Then in January 2008, the Environment Agency removed a flap valve from the existing outlet pipe through the flood bank to allow some limited tidal inundation over the pasture. Following further negotiations, we created three wetland scrapes to hold water in the pastureland and installed a tidal exchange (large penstock and culvert) through the flood embankment in early spring 2010. This tidal exchange opened up to 25 ha of marshy pastureland to tidal influences. Through colleagues in Natural England we also employed RSPB's rotary ditch cutter to enhance the newly created saltmarsh creeks and improve the habitat value of the scrapes.

At Goswick, saltmarsh is now developing over approximately 5 ha of land where there is a regular tidal influence. However, the whole 25 ha is wet pasture subject to tidal influences during more extreme tides. There is 3 ha of saltmarsh on Beal pastureland. The farmers are receiving a 20-year HLS agreement for the 5 ha saltmarsh area, and 10-year agreement for other habitat elements elsewhere on the farm, such as goose management options for the rare pale-bellied Brent geese that are an autumn/winter feature of the Lindisfarne Nature Reserve. The farmer at Goswick stated that 'the environmental schemes are a vital source of income. I am aware not all producers have farms that are as highly valued as Goswick…, so I consider myself very fortunate' (Beating the odds to farm in a challenging landscape, *Farmers Guardian*, 13 August 2010).

Following removal of the flap valve at Goswick and increased tidal inundation, bird monitoring from 2007 to 2009 showed increases for most species, notably lapwing and yellow wagtail numbers. Lapwings are breeding at the site and increased from seven pairs in 2007 to 14 pairs in 2009. Breeding yellow wagtail increased from one to 2-3 pairs. One pair of snipe and one pair of oystercatcher were breeding at the site. In summer 2009, one redshank was seen displaying over the wetland field at Goswick, which gives optimism for future breeding once the wetlands become more established.

In addition to the habitat elements, Natural England supported Beal Farm, as part of the 4shores Project, to develop a barn into a visitor interpretation facility and café, the successful *Barn at Beal*, located adjacent to the Goswick and Beal wetlands and ideally placed on the tourist route to Lindisfarne. HLS has also supported associated recreational facilities such as permissive footpaths and interpretation at the wetland sites.

Catchment Solutions to Flooding

The town of Belford in Northumberland has records of flooding dating back to 1877. In July 2007, the village flooded badly and a local press headline 'Sick of sandbags and sympathy' (12 July 2007, *Northumbrian Gazette*) summed up the attitude of the local community.

We carried out a feasibility study and traditional flood defences were not suitable for Belford owing to the high cost, lack of space for flood walls and banks and it did not meet the criteria for Grant-in Aid funding due to the low number of properties at risk (35).

There was a desire by the Environment Agency's North East Local Levy team to deliver an alternative catchment based solution to the problem so we created a partnership with Newcastle University to address the issues using soft engineered runoff management features. The University had trialled runoff management features at their research site, Nafferton Farm, where sediment traps and nutrient recovery features were first trialled so we wanted to put these into practice.

The potential to use runoff management features for flood control at source was also evaluated as part of the *Making Space for Water* Initiative. The conclusion of this work gave rise to the concept of Farm Integrated Runoff Management (FIRM) plans, which manage flow paths directly by storing, slowing and filtering runoff at source on farms. The features are multipurpose addressing water quality, trapping sediment, creating new habitats and storing and attenuating flood flow.

The main aim of the Belford project is to slow down and reduce runoff from the farmland upstream of the town. To achieve this, we worked with the four farmers in the catchment to look at the overland flow paths and how we could install simple features to store or slow down this runoff during periods of heavy rain. We used local contractors, or the farmers carried the work out, to install the features and agreed a standard compensation amount per feature.

We have installed 30 features that either store excess water or slow the travel time of the flood peak, or both. Below is a list of the different types of features we have used:

- The online and offline pond features involve either a bund across the river channel or a bund adjacent to the river that excess water spills into. The features work by storing water when the river is high, and releasing it slowly back to the river after the peak has passed.
- We have built field ponds by placing a bund in the lowest part of the field to intercept overland flow paths, store the water and then release it slowly once the rainfall has eased. The worst flooding occurs in Belford when overland flow leads to rapid runoff from the surrounding farmland.
- Large woody debris has been installed in woodland to slow the flood peak and divert it onto the floodplain. The debris is placed over the tributary of the Belford Burn to divert water onto the floodplain. In Blagdon Dean woodland, the woody debris has almost doubled the travel time of the peak through this stretch of the watercourse from 25 to 45 minutes.
- Planting shrubs and pinning timber to the woodland floor has provided greater roughness.
- In some areas, we have trialled bands of willow across the floodplain, called 'willow hurdles' to add further roughness.

Leaky pond at Belford

The project is coming to an end and we have implemented ongoing monitoring with Newcastle University to determine the impact of the features on the flow in the river and the time the water takes to travel during heavy flows. They are also monitoring the levels of diffuse pollution in the burn around certain features to determine the benefits the work has on water quality.

The features in the catchment have performed well during large flood events and protected properties from flooding. During both the September 2008 flooding and July 2009, the river peak was slow to rise (compared to previous events) and only one property flooded out of 35 at risk. The project also demonstrates the multiple benefits that can be achieved by implementing simple land management techniques. The land owners have continued to farm the land, with the features only taking up minimal space on their farmland. We have worked closely with them to schedule works to fit in with the farming calendar which is most important to the farmers. A DVD has been created about Belford Catchment Solutions Project as there has been a lot of interest nationally about the methods we have used to address the risk of flooding. Please contact Phil Welton at Philip.welton@environment-agency.gov.uk if you would like a copy.

Funding and Partnerships

The Northumbria Local Levy is raised by the Northumbria Regional Flood Defence Committee through a levy on Local Authorities. It delivers a programme of projects that focus on locally important flood relief and climate change adaptation schemes to communities that would not otherwise attract Grant-in-Aid funding.

The Northumbria Local Levy Programme provides the Project running costs, with further support for coastal wetland implementation from the Regional Flood Risk Management Habitat Creation Fund. However, management of the wetland sites as saltmarsh and brackish or freshwater wetland habitats by the farmers into the future could not be secured without the mechanism of the Higher Level Stewardship agri-environment scheme.

Higher Level Stewardship

Higher Level Stewardship (HLS), administered by Natural England, aims to deliver significant environmental benefits in high priority situations and areas. It supports lower intensity land use through grant funding for periods of 10 or more years. Schemes are usually complex, and are agreed between land managers and Natural England's advisors on a case by case basis. Supporting HLS is usually combined with Entry Level Stewardship (ELS). There are a wide range of management options, and these are designed to support key features of the different areas of the English countryside. HLS can contribute to a wide range of capital works such as restoration of riparian and wetland habitats.

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Evidence-Based Conservation on Farmland - Making it Possible

Lynn Dicks and William J Sutherland
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A project led by the University of Cambridge is compiling scientific knowledge about how to protect and enhance biodiversity on European farmland. The project will present the information in a way that is easy for policy-makers and practitioners to use. It's a very important step in moving towards evidence-based conservation.

'Evidence-based' has become a bit of a buzzword (or two). It is one of those excellent terms that you cannot really argue with. Like sustainable development. "Of course we want development to be sustainable" say the politicians. There is little point in development that is not sustainable, after all. Evidence-based policy and practice fall into the same class. Clearly, policies that are plucked out of the air and not based on any evidence are entirely undesirable.

But what exactly is meant by 'evidence-based'? And more importantly, how can we make it happen? One definition being used in parliamentary circles says that 'Evidence-based practice requires the collection and analysis of valid impartial data regarding past decisions and the application of the knowledge to future decision making'. This is a good definition because it covers the two important facets required for anything to be evidence-based. First, there has to be relevant evidence. Second, the evidence has to be accessible, so it can be applied to future decision-making.

The Evidence is Out There

In the case of wildlife conservation, there is no doubt there is a substantial evidence base. Much of it is in the scientific literature. The Conservation Evidence project (see Links at the end of this article) has identified at least 136 journals containing science relevant to conservation practice and many of them go back decades. There has also been a good amount of research commissioned by Government and other organisations, published in reports that are sometimes referred to as 'grey literature'.

Of course, not all of the scientific research on ecology and conservation is directly relevant to the practice of conservation. There is basic information on species distributions, ecology and habitat use. There is research about the current status of species and habitats, and the factors that adversely affect them. All of this should inform policy and practice, but it is not always straightforward to apply it directly to decisions about future conservation strategy.

Arguably the most relevant information comes from research that examines strategies to improve the status of wildlife and habitats. Recently, we did a quick survey of the contents of two years' worth of one conservation journal. We found that over 60% of the research papers were about the basic ecology of species. Less than 10% were in the last category - applying science to find out whether conservation practices work as intended, or not. Those 10% of research papers dealing with solutions are of very strong interest to policy-makers and practitioners working to conserve wildlife.

Given that there is an evidence base, the next challenge is to make that evidence accessible so that it can be applied to future decision-making. At present, the existing knowledge is not very accessible. Most journals are subscriber only. Even with access, interpreting results can be tricky for people not familiar with the latest modelling and statistical techniques. There is not enough communication between research scientists and practising conservationists, as we have seen from the weak focus of research on practical solutions.

Reviews are frequently published that make some evidence accessible. The Centre for Evidence-Based Conservation at the University of Bangor (see Links) compiles and publishes detailed systematic reviews of pertinent policy questions, and trains policy-makers and practitioners to use them. These address specific questions and review the evidence thoroughly, with statistical analysis of the combined results if possible. Recent reviews have addressed questions such as 'What is the impact of public access on ground-nesting birds?' and 'How do draining and re-wetting affect carbon stores and greenhouse gas fluxes in peat soils?'.

But when you are making decisions it helps to see evidence for a wide range of possible options. The Conservation Evidence project, based at the University of Cambridge (see Links), works to provide an ongoing synthesis of evidence that is as broad as possible.

Focus on Farmland

A robust evidence-based approach to farmland conservation is particularly important in Europe because of the sheer amount of public money being spent on agri-environment schemes. These schemes are largely intended to protect wildlife and habitats, with a subsidiary focus on enhancing access to the countryside. Over £612 million was paid directly to UK farmers under agri-environment schemes in 2008, according to Defra statistics[1]. Agreements in England received £388 million. The entire budget of England's nature conservation agency Natural England for 2008-2009 was £176 million, less than half the amount spent on agri-environment schemes. A similar proportion holds for Scotland. With this amount of spending it is quite legitimate to ask whether the agri-environment money is being well spent.

Our research project 'Linking Evidence and Policy for Managing Biodiversity in the Agricultural Landscape' is compiling evidence relating to wildlife conservation on farmland, and presenting it in a way that is accessible to non-scientists. It is a crucial stage in the development of evidence-based conservation. To use knowledge to influence future decisions, or to find out whether agri-environment schemes represent value for money, you must first know whether the prescribed actions work as intended.

The research is associated with the Conservation Evidence project. It is funded for one year by the Economic and Social Research Council under the Rural Economy and Land Use

programme (RELU www.relu.ac.uk). The core project team involves the Universities of Cambridge and Essex, the Royal Society for the Protection of Birds (RSPB), the British Trust for Ornithology (BTO) and the United Nations Environment Programme's World Conservation Monitoring Centre (UNEP-WCMC). We are also working with collaborators from Harper Adams University College, the University of Lund in Sweden, the Scottish Government and two agri-environment consultancies.

During the project we will draw on the expertise of a range of people directly involved in farmland conservation, either as advisors, conservationists, land managers or policy-makers (see box on following page). The procedure we will follow for compiling evidence is described in Figure 1.

Figure 1. A process for making evidence accessible

The first stage is to come up with a list of all the possible actions you can take to benefit wildlife on farmland. We call these 'interventions'. They can be anything from paying farmers to leave land uncultivated to specific measures that avoid bird mortality during harvest. The list is devised collectively by the project team, collaborators and the consulted experts, and it is meant to be as inclusive as possible. So far it comprises over 120 different interventions.

The next stage is to review the literature. We are starting with a thorough search of online scientific databases carried out by a team led by Nicola Randall at Harper Adams University College[2]. This collected scientific papers, books, conference proceedings and reports with evidence relating to the effects of farm-scale interventions on biodiversity in temperate Europe. From this review (over 1,000 individual references), we are extracting cases where an intervention has been tested and its effects monitored. We are drawing in other sources of evidence too, including the ongoing review process carried out by Conservation Evidence, unpublished results from previous RELU projects and systematic reviews.

The final stage is to synthesize this evidence and present it in a usable form. The findings of each study will be summarised briefly (*without* technical jargon). These summaries will be put together for each intervention in the list, along with a short statement that brings together all the evidence for each intervention.

For example, the intervention *Manage hedges to benefit wildlife* involves cutting hedges less frequently, avoiding herbicide and pesticide use, filling in gaps and traditional management techniques such as hedge-laying. The summary statement for this might read:

'Eight studies have tested the effects of managing hedges to benefit wildlife. Five showed benefits to wildlife, often an increase in the number of plant species (four studies). Three studies showed no clear effects, or complex effects of hedge management on numbers of species present in the hedge.'

The summary statement is linked to more detailed descriptions of each piece of evidence, citing the original source, so you can trace the evidence if you need to.

At the end of the project, all this information will be made available in three ways:

- As a PDF to download from www.conservationevidence.com.
- As text for individual interventions on the searchable database at www.conservationevidence.com.
- As a book in the Conservation Evidence Synopsis series, printed by Pelagic Publishing and for sale from www.nhbs.com.

Presenting the scientific evidence like this, organised by intervention, allows you to see what evidence there is to support an action you might be considering. Importantly, you can also see a list of alternative actions that might apply, and the evidence relating to them. The process shows very clearly where there are gaps in our knowledge.

The idea is to inform decision-making. It is not to tell anyone how to conserve wildlife on farmland. The Conservation Evidence Synopses are modelled on the resource *Clinical Evidence* used by medical practitioners to access evidence. Like medics, conservationists deal with complex subjects. They might be individual sites, species, ecosystems, farming systems or entire landscapes. The practitioner herself/himself knows the subject's background and the detailed context of the case. It is they who should make the final decision about what to do. Our presentation of evidence provides relevant information that should help, not directed advice.

Setting Research Priorities

A secondary aim of the Linking Evidence and Policy project is to find out how relevant the existing evidence base is, to real life conservation. Does it answer the questions that bother people who are implementing conservation in the real world?

The process of finding this out gives us a real opportunity to set research priorities for the future.

We will ask our expert consultees, all of whom are engaged directly in the policy or practice of conservation on farmland, to score the interventions according to how important each one is for wildlife. This will enable us to rank the interventions, with the most important to policy-makers and practitioners first, based on the views of these 60 or so people.

As a separate exercise we will evaluate the state of knowledge about each intervention using our own literature review. How well do we know whether this works or not? The state of knowledge will range from 'no evidence at all' to 'perfect knowledge, no need for further research'.

Plotting the priority scores against state of knowledge scores on a graph provides a simple and straightforward

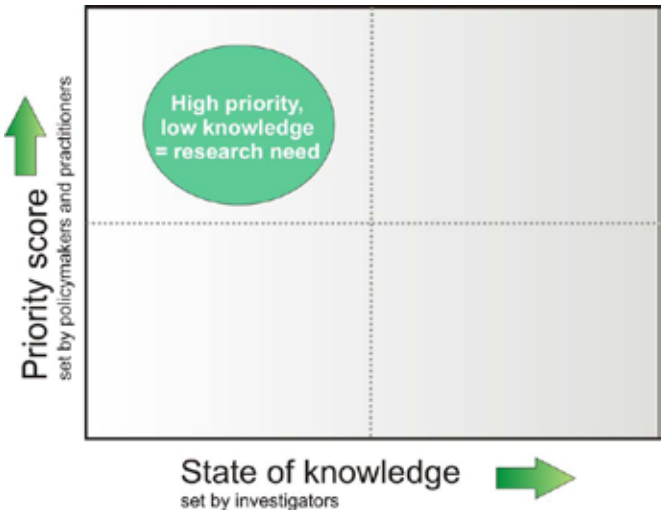

Figure 2. How to set research priorities

way to set research priorities for the future (Figure 2). On this graph, each intervention will be a single data point. Those that appear in the top left quadrant are the priorities for research. These are interventions for which knowledge is low, but importance, as scored by policy-makers and practitioners, is high.

Forging stronger links between science, policy and action is a crucial part of the developing framework for evidence-based conservation. Researchers need to be more aware of the priorities and needs of practitioners and policy-makers, just as much as decision-makers need easy access to the science.

In future, we hope this process of gathering and interpreting evidence from a practical perspective becomes an obligatory accompaniment to ongoing research activity. The model can be applied not just in conservation but in other areas where science informs policy and practice, such as public health, education and broader environmental issues. The result should be that scientific knowledge is always applied where it is relevant. The ultimate outcome ought to be that actions taken at all levels have higher impacts and are more cost-effective.

An invitation to take part

If you are directly engaged in wildlife conservation on farmland, or devising and implementing policies to support it, you are invited to take part in the project as one of our expert consultees. You might be a land manager, a conservationist in the public or private sector, a farmer, a campaigner, an adviser or consultant or a policy-maker.

Taking part involves sharing your opinions and expertise through simple listing and scoring exercises. We will be consulting our experts twice, between February and May 2011. In phase one, you will review our draft list of interventions. You will tell us whether you have heard of each one and which you have (ever) directly carried out. You will have a chance to add interventions we have missed. In phase two we will ask you to score the interventions according to how important they are in conserving wildlife on farms, and give us your opinion about the state of knowledge on each intervention.

By taking part, you will be helping to link scientific research with the practice of conservation on farmland. If you are interested, please contact Lynn Dicks by the end of March 2011.

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Links

Conservation Evidence website:
www.conservationevidence.com

Collaboration for Environmental Evidence:
www.environmentalevidence.org

Centre for Evidence Based conservation:
www.cebc.bangor.ac.uk

Rural Economy and Land Use programme:
www.relu.ac.uk

The first published synopsis of evidence, *Bee Conservation: evidence for the effects of interventions*, is available as a book from www.nhbs.co.uk.

Notes

[1] http://www.defra.gov.uk/evidence/statistics/foodfarm/general/auk/latest/excel/index.htm

[2] This search method is described in the Finalised Protocol for Systematic Review number 35 in the Environmental Evidence library at:
http://www.environmentalevidence.org/SR35.html

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The East of England Wildlife Site Project:

Helping get Local Wildlife Sites into Higher Level Stewardship

Nick Carter FIEEM
Norfolk Wildlife Trust, on behalf of the Wildlife Trusts of the East of England

Introduction

Local (County) Wildlife Sites (LWS) make an important, but underrated, contribution to nature conservation in England. However, some LWS are neglected or not managed for conservation resulting in a reduction in their value as wildlife habitats. The advent of Natural England's Environmental Stewardship scheme (which includes Entry (ELS) and Higher Level Stewardship (HLS) schemes) has enabled landowners to receive support for carrying out appropriate management on such sites. The East of England Wildlife Site Project, a two-year Natural England-funded initiative with the Wildlife Trusts, aims to help owners of LWS, who would not have otherwise considered applying for HLS, make high-quality applications. Although it is early days, the project is gaining momentum and it is intended by the end of the project in April 2012 to have directly helped more than 30 LWS owners to make successful HLS applications and to raise the profile of LWS with landowners and conservationists.

East of England Wildlife Site Project

Based in Norfolk Wildlife Trust's headquarters in Norwich, I cover Norfolk, Suffolk, Hertfordshire, Bedfordshire, Cambridgeshire and Essex. As the project officer I target private landowners, such as parish councils and those who only own a few hectares, and who are not currently in any agri-environment schemes other than Entry Level Stewardship. By offering free site visits combined with tailored advice I can boost the opportunities available to small landowners who often cannot afford to employ consultants.

Some LWS are managed using volunteers or professional contractors at the personal expense of the owner and are not in any sort of long-term management agreement, so are vulnerable to changes in the circumstances of the owners. As many LWS contain Biodiversity Action Plan (BAP) habitats, such as lowland meadows, calcareous and acid grasslands and lowland heath, they are priorities for HLS applications. The importance of LWS is increased if they occur in HLS Target Areas that are described on Natural England's website and can contribute to one or more land management activities: (www.naturalengland.org.uk/ourwork/farming/funding/es/hls/targeting/).

Alien plants, such as Himalayan Balsam, can out-compete native plants ***Photo: Nick Carter***

I carry out site visits and meetings with landowners, in association with county Wildlife Trust personnel, to discuss their aspirations, management issues and options. I also help with personal and land registrations with the Rural Payments Agency, which can turn out to be a lengthy and complicated process. I undertake the Farm Environment Plan to assess habitats, their condition and suggestions for ELS and HLS management options, as well as completing the main application process on behalf of the landowner. To date from over 20 LWS visits, I have submitted three applications and a further 11 are in various stages of completion. The main target of the project is to get 30 or more HLS applications submitted by the end of the project in April 2012.

Another aim of the project is to raise the profile of LWS, especially with landowners. I will do this by attending farm walks, placing articles in the farming press and attending county and agricultural shows. I will also raise awareness by giving talks and writing articles for conservationists.

Project Challenges

One of the main challenges for the project is a practical one; the owners of many LWS are unknown to the Wildlife Trust and even when the owners are known they may be very reluctant to proceed with an HLS application. This is often because of concerns about working with a government organisation, such as Natural England, or with a conservation body, like a Wildlife Trust, or simply that the owners do not want to be tied down to set management options. These views are often deeply ingrained and are difficult to change.

Where an owner is interested in developing an HLS application, and the Natural England adviser considers an application appropriate, it is important to determine the management problems that the LWS faces and the relevant environmental features that can be targeted in the application. The former often involve under- or over-grazing and inappropriate or lack of management with conservation in mind. In addition to HLS management options, organisations, such as Wildlife Trusts and the Farming and Wildlife Advisory Group (FWAG), can provide conservation management advice to landowners as well as practical help such as sourcing graziers and fencing contractors.

In the arable East, where the project is based, the most critical habitat for LWS is grassland. Many of the flower-rich grassland LWS still exist because they are either unsuitable for agricultural intensification, often because they are too wet, are commons owned by Parish Councils or sites owned by non-farming individuals. The area of grassland is much smaller and the number of grazing animals is much lower than in former times. Many sites are small and isolated from other grassland areas making grazing difficult to organise. Failure to graze LWS leads to them scrubbing up quickly and then turning into woodland over a longer period of time. Whilst these are valuable habitats for species such as Turtle Dove and other BAP farmland bird species, it means that the area of species-rich grassland declines further.

Woodland habitats can deteriorate because of a lack of management, such as a cessation of rotational coppicing, but usually over a longer period than grassland sites. Even where coppicing is practised, the increase in deer populations in many parts of England may prevent regrowth. Poor deer management will also result in an impoverished understorey. It is perhaps no surprise that as deer numbers have increased some woodland bird populations, particularly migrant species, have been in long-term decline (http://www.bto.org/birdtrends2010/key_findings.htm).

Invasive alien species such as Himalayan balsam *Impatiens glandulifera* and New Zealand pygmyweed *Crassula helmsii* are already causing problems on some LWS. Left uncontrolled these plants have a detrimental impact on native plants and the condition of the sites in the future.

Many of the more than 100 options in Higher Level Stewardship (HLS) are relevant for LWS management. As the LWS, in the East of England, most in need of management or restoration are usually grassland sites then the HK category of options are most useful, especially HK6 and HK7 Maintenance/Restoration of Species-rich, Semi-natural Grassland, HK10 and HK12, Maintenance and Restoration of Wet Grassland for Wintering Water Birds, and HK15 and HK16 Maintenance/Restoration of Grassland for Target Features. The first two options involve grazing and/or cutting for hay; no ploughing, reseeding or new drainage; and no heavy poaching. The middle two involve elements to do with water control, removing grazing animals during the winter and ensuring minimal disturbance during the winter. The final two options are used for semi-improved or rough grassland which is known to provide good conditions for target species and other features. Usually associated with HK7 are capital works for scrub clearance, although where some scrub is retained, usually to benefit farmland birds, HC15, Maintenance of Successional Areas and Scrub is employed. The recent loss of Access options has affected some of the applications. As HLS agreements last for 10 years, with a break-clause after five, they give LWS management a lengthy period of stability.

National Indicator 197

In 2008, a new approach was introduced that boosted the importance of LWS. A set of 198 National Indicators was introduced and Local Authorities (LA), together with their partners, had to select up to 35 Local Indicators to become part of their Local Area Agreements (LAA). Central government funding was available in relation to delivery plans set out in the LAA process. Progress against each of the targets for each indicator was monitored and reported on annually. NI197 (improved biodiversity – proportion of LWS where positive conservation management (PCM) has been or is being implemented) is the key one in relation to LWS. This process raised the profile of LWS in political and conservation circles enormously and was vital in understanding whether sites were being managed for conservation. HLS was beginning to play a major part in helping to get LWS into PCM and this project was partially set up to get more sites into PCM to help meet the target for NI197.

Counties were generally achieving their targets, for example Norfolk had achieved 56% of LWS in PCM and an annual increase of 5% by 2010. Unfortunately, October 2010 saw the abolition of LAA by the coalition government, with LA having the authority to drop any targets. Even if some LA retain NI197 there will be no central collation of progress and there will be no further central government funding. There is also no requirement for LA to prepare new LAA in April 2011. Instead there will be an agreed, single list of data requirements for LA which will be developed by April 2011. This development could have negative consequences for increasing the number of LWS in PCM, although early indications are that NI197 will continue to be measured across much of the region.

The Future for Local Wildlife Sites

LWS are locally selected areas that are rich in flora and fauna. LWS differ from Sites of Special Scientific Interest (SSSI) in that they are non-statutory and they aim to be a comprehensive, rather than representative, inventory of sites. Although they have no statutory protection they are considered in the planning process under Planning Policy Statement 9 (PPS9) Biodiversity and Geological Conservation (Anon 2005) and there is a presumption against

Cleared areas of grassland can be quickly recolonised by scrub such as birch ***Photo: Nick Carter***

developments that are likely to have adverse effects on the biodiversity within a LWS. Importantly for landowners, a site being designated as a LWS has no effect on its status for public access or the operation of ordinary land management and agricultural operations.

LWS originated in the mid 1980s and were in general identified by Local Authority-led surveys, with Wildlife Trusts playing a key role in ensuring good coverage. In Norfolk, 91% of the county was covered in the first survey during the 1980s, with land owned by the Forestry Commission, Ministry of Defence and the Broads Authority area excluded. LWS surveys are usually based on Phase 1 habitat surveys. A consequence of this is that sites were originally identified on their botanical diversity and the presence of key animal species was generally less important. With the introduction of targets for BAP species there has been a move to designate sites on this basis but there is variation across counties. For example, in the East of England, Bedfordshire has no sites designated solely for particular animal species, Norfolk will designate a site as a LWS if the habitat falls just below the criteria but the site has important BAP species, such as water voles *Arvicola amphibius* or great crested newts *Triturus cristatus* while Essex has a number of sites designated because of the presence of individual species, such as dormice *Muscardinus avellanarius*, invertebrates (*e.g.* a bumblebee *Bombus ruderatus*) and reptiles, especially great crested newts.

Selection Criteria for each habitat have been developed in each county to decide whether a site should be designated a LWS. In order to develop a consistent approach between different counties, Defra published guidelines for the identification and management of LWS (Anon 2006). Each county was encouraged to assess itself against these guidelines and make any changes necessary to the way in which it operated.

The recent report by Lawton *et al.* (2010) stressed the importance of LWS and argued that such sites should be given greater protection and more effectively safeguarded. Because of the large number of LWS (almost 40,000 in England alone covering 4% of the area compared with 4,000 SSSIs covering 7% of the land area) they have an important role to play in ecological networks and large-scale ecological schemes, such as the Wildlife Trusts' Living Landscapes, which was also highlighted in the Lawton Report. The importance of LWS for biodiversity had also been stressed in England's Biodiversity Strategy (Anon 2002). As such, they play a significant part in meeting BAP targets.

It is important that LWS receive greater protection, as recommended by the Lawton Report, to ensure further valuable sites are not lost through neglect or poor management for conservation. The East of England Wildlife Site Project is a model for ensuring HLS develops as a conservation management tool for LWS so that they are managed for conservation in the future.

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Sustaining High Nature Value Farming Systems:

Lessons from the West of Ireland

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High Nature Value (HNV) farming is low intensity farming that supports a high diversity of semi-natural habitats or species. A number of economic and social factors have led to significant declines in HNV farmland. Some policy initiatives to conserve HNV farming systems have been adopted at European and national scales, but it remains to be seen how they will be affected by the upcoming Common Agricultural Policy (CAP) post-2013. Two case studies of HNV farming systems (Smith *et al.* in press) were carried out in the west of Ireland to stimulate interest in this topic and to inform future policy development, and we summarise some of the main findings and recommendations of this study.

Traditional extensive farming practises have helped to create large parts of the European landscape as we know it today. The relationship between farming and natural heritage is one of mutual inter-dependence. Our landscape is the product of millennia of interaction of the natural environment with human land use, particularly farming. Much of Europe's natural heritage is influenced by or has evolved in response to these interactions. Maintaining that heritage relies on maintaining the more traditional, extensive type of farming – HNV farming – that influenced its development, and the farmers' role in this dynamic, is critical.

HNV farming systems are characterised by low intensity, low input management, often including livestock grazing of semi-natural vegetation (see Box). This low intensity management is beneficial for the habitats and species that have developed in tandem over centuries of traditional extensive farming. As only a small proportion of HNV farmland is formally designated for nature conservation, European biodiversity conservation goals cannot be met solely by designating sites. Sustaining the farming practices that maintain and enhance the richness and diversity of landscapes, habitats and species is also required.

Three Types of High Nature Value farmland

- Type I: Farms with a high proportion of semi-natural habitats used for extensive livestock grazing, *e.g.* Connemara, Aran Islands.
- Type II: Farms with smaller areas of semi-natural habitat occurring in mosaic with more intensive agriculture.
- Type III: Intensively managed farmland with little semi-natural habitat that nevertheless supports species of conservation concern, *e.g.* protected bird species.

HNV farmland is often economically marginal farmland. During the 20th century, modern intensive agriculture replaced HNV farming over much of Europe, with resulting biodiversity losses. The remaining area of HNV farmland is in decline, as low intensity farming typically generates poor income, leading to increases in part-time farming and a shrinking population of mainly older farmers. These socio-economic challenges often result in a reduction in farm management, partial or even complete abandonment leading to encroachment by scrub or bracken, with associated losses of biodiversity. Farmers under pressure may also respond by completely changing their land use, including planting forestry or selling their land to developers.

In response to the threats to HNV farming, EU Member States have committed themselves to identify all HNV farming areas in their territories and to put measures in place to protect a significant proportion of them. Currently, the main support mechanism for HNV farming is the European Agricultural Fund for Rural Development (EAFRD), which provides payments for farmers in Less Favoured Areas, compensatory payments for farmers whose lands are part of the Natura 2000 network, and Agri-Environmental Scheme (AES) payments. The European Environment Agency (2004) concludes, however, that 'these instruments… do not appear to be well targeted at high nature value farmland areas'. Thus, these measures are insufficient to stop the loss of biodiversity in Europe. The future shape and level of European funding for HNV farming is currently uncertain. Formal review of the CAP in preparation for the period post-2013 has commenced, and funding levels and baseline environmental standards above which payments will be permitted are emerging as crucial issues.

Case Studies

Until recently, Ireland has made little progress in achieving the aims of identifying and supporting HNV farming, in part due to a lack of information on what HNV farming is in this country. Thus, the Heritage Council commissioned case studies of HNV farming in the west of Ireland to better understand the relationships between biodiversity and associated farming practices and to develop recommendations for measures to conserve HNV farming. The project was overseen by a steering group drawn from the nature conservation and agricultural sectors.

The objectives of the case studies were to collect information on current and past farming practices, the biodiversity of the case study areas, and threats to HNV farming. These data were then used to develop recommendations on measures to sustain HNV farming in the case study areas and elsewhere.

The case study areas selected were the Aran Islands and north Connemara in County Galway. These were chosen as they are of national importance for natural heritage, they are characterised by low intensity farming, and it was considered likely that changes in farming are occurring that could impact on biodiversity. Furthermore, the study areas present contrasts in farming systems and ecology (discussed below) that would allow more generally applicable conclusions to be drawn.

Case study areas

A critical part of the case study methodology was direct engagement with farmers. A series of public meetings was held to gather information on current and past farming practices and the challenges they face in maintaining HNV farming. Their views on nature conservation, agri-environmental policy and potential solutions to HNV farming threats were canvassed. At the meetings, volunteers were sought for a series of more detailed farm-level ecological surveys and interviews.

Thirteen individual farm surveys were carried out in each of the case study areas. The ecological component involved field and desk-based studies of the habitats, flora and fauna on each of the farms. Information on farm management was collected during field surveys and during an interview using a detailed questionnaire. On the Aran Islands, some of the interviews and public meetings were carried out through the Irish language.

Results

Aran Islands

Along with the Burren, the Aran Islands are perhaps the best example remaining in Ireland of a traditional agricultural landscape. The islands are characterised by a multitude of small pastures separated by a network of dry stone walls. The pastures themselves are mosaics of orchid-rich calcareous grassland, limestone pavement and calcareous heath, all EU Habitats Directive Annex I habitats. Dune systems, machair and lowland hay meadows can be found in the lower-lying northern parts of the islands. Raising beef cattle for export and finishing on the Irish mainland is the chief agricultural enterprise. Cattle are wintered in the rocky, species-rich pastures in the south of the islands before being brought down to more improved grasslands around the settlements in the northern half. It is this system of extensive winter grazing that maintains botanically diverse calcareous grassland and heath. In the absence of grazing, these habitats would become invaded by bracken, bramble and other scrub or become rank, low-diversity grassland, thus losing most of their conservation value. In fact, this has already occurred in small unused lanes between fields and in some of the less-managed fields.

Until recently, farming on the Aran Islands was much more self sufficient, with significant amounts of potatoes, vegetables and cereals grown, some for export to the mainland. These enterprises have declined as they have become less profitable and cheap produce from the Irish mainland and further abroad has become more readily available. Potato and vegetable growing for home use is still widespread, but the traditional practice of growing rye for thatching is in severe decline. Rye cultivation has allowed the persistence of a number of rare arable weed species, such as cornflower *Centaurea cyanus*, on the Aran Islands through the 1980s at least; however, their current conservation status is unknown.

North Connemara

North Connemara is a mountainous, agriculturally marginal region with many habitats of conservation importance. The uplands are occupied by upland blanket bog, dry and wet heath and acid grasslands. The lowlands support semi-improved, often wet grassland, lowland blanket bog and wet heath, coastal habitats, conifer plantations and small pockets of semi-natural woodland. A typical north Connemara farm is composed of an area of lowland grassland and a larger area of upland commonage. Lowland grasslands are used for cattle and sheep grazing, with hill sheep pastured in commonage for part of the year. In the recent past, CAP subsidies led to drastic overstocking of commonages with severe overgrazing and erosion of upland blanket bog and wet heath. Mandatory destocking programmes have been put in place to reverse these impacts, but monitoring has found mixed ecological responses to decreased grazing pressure. Many farmers have ceased using their commonage altogether, and there is virtually no cattle grazing in the uplands of north Connemara. There is some indication that localised undergrazing has resulted in scrub encroachment or dominance by purple moor-grass *Molinia caerulea*. However, the situation is complex, and some places may have suffered a long-term decrease in ecological value and grazing potential where overgrazing and trampling has been particularly severe.

As with the Aran Islands, there has been a trend towards simplification of farming practices in north Connemara. Suckler cattle and sheep are the main enterprises, with little tillage or hay-making carried out. The latter has resulted in decreases in the diversity of lowland flora and birds. In addition, mixed cattle and sheep enterprises are declining with many farmers choosing to focus on one or the other. Mixed cattle and sheep grazing can benefit biodiversity of grassland swards due to their different grazing behaviours. Limited poaching by cattle can further diversify swards that under sheep only often develop into close-cropped putting greens.

Threats to Farming

Despite the very different farming systems and ecosystems in the two case study areas, there are many similarities in the challenges faced by HNV farming, suggesting the potential for unified solutions. The main challenges to HNV farming include changes to the agricultural economy and policies that limit farm enterprises and lack of access to markets. These changes include decreases in the price of farm produce, limited markets for many traditional products, and increasing costs in complying with environmental and food safety regulations. In both case study areas, there are no local butchers/abattoirs, largely due to the cost of compliance with strict food safety regulations and

North Connemara HNV farming landscape
Photo: Eamonn Delaney

Aran Islands HNV farming landscape
Photo: Eamonn Delaney

economies of scale. Produce must therefore be sold outside of the region to a limited number of suppliers, and this makes marketing local, conservation-grade produce difficult.

Over the long-term, the numbers of full-time farmers have significantly declined due to economic pressures. Together with greater availability of part-time and full-time off-farm employment opportunities (at least until the recent economic downturn), the labour-intensive farming lifestyle has become less attractive to much of the younger generation. Poor incomes and dissatisfaction with the current state of farming is leading to an ageing and shrinking population of largely part-time farmers. Due to farm consolidation, the average farm in both case study areas is becoming increasingly larger and more fragmented. Larger, more fragmented farms and lack of labour lead to reduced levels of agricultural management. One manifestation of this is the simplification of farm enterprises, with a resulting decrease in habitats and species, particularly those associated with hay meadows or cereal tillage. Partial or complete land abandonment and reversion to scrub is a potential threat. This was not observed on any of the case study farms; however, only actively managed farms were selected for detailed survey, and scrub invasion was observed on other unsurveyed farms in the case study areas.

An additional factor that farmers believe is discouraging younger generations entering farming is the manner in which agri-environmental and nature conservation policies have been implemented. These have been largely implemented in a top-down fashion, with little consultation or discussion with farmers. This has alienated farmers, who state that they do not fully understand the objectives of many of the restrictions and who feel they are unfairly bearing the costs of providing public goods and ecosystem services.

Some positive factors did emerge from the case studies, however. The current generation of farmers love and take pride in farming, and most have no desire to leave farming. They recognise the importance of their role in managing landscapes and ecosystems and consider themselves lucky to live and work in HNV farming landscapes. There is the potential to harness these positive views of their environment and also a desire for greater self-sufficiency to benefit habitats and species dependent on HNV farming systems.

Policy Lessons

The case studies, in addition to other HNV farming projects such as the BurrenLIFE Project (see Jackson 2010 for a summary), generated several policy lessons which are outlined below. They highlight the need for measures to support HNV farming in a more targeted way and to accommodate regional differences in farming practices, habitats and species. The case studies also point towards ways in which links can be forged between vibrant rural communities and nature conservation.

Fostering Better Relationships

Increased communication between local farmers and policy-makers is necessary for farmers to buy into the objectives of agri-environmental and nature conservation policy. Farmers should have greater participation in developing policy measures, including agri-environmental scheme design and commonage destocking, without sacrificing conservation objectives. Greater farmer ownership of policy measures will improve their success as their participation would be more proactive and willing, rather than grudging and reactive.

Identifying HNV Farmland

Supporting HNV farming and associated biodiversity in Ireland requires adequate information. Farming systems and agricultural landscapes that can be considered HNV farmland in Ireland requires clearer definition. Indicators should be used to identify and monitor potential HNV farmland at the national and European scales. Caution should be exercised in mapping HNV farmland to avoid confusing the HNV farming concept with another set of designated areas. Designation of broad 'HNV farmland areas' for support runs the risk of providing benefits to intensive farmland within these areas while denying benefits to HNV farmland within an otherwise intensively farmed landscape.

Agri-Environmental Schemes

HNV farmland should be specifically targeted for support under AES, whether as separate schemes or as an element of a wider scheme. Such a scheme should focus on threatened, rare and declining habitats and farmland species and should ensure that the maximum payments made under the scheme are targeted to the farmers whose land is of greatest heritage value. As noted above, scheme entry criteria should be evaluated at the individual farm level. Scheme requirements should be simple and flexible and focus on conservation results rather than strict management methods or prescriptions. This will permit adaptive management by farmers faced with changing weather and economic conditions. A focus on results rather than management prescriptions will require training to improve the conservation management skills of farmers and scheme assessors. In the current economic climate, this presents funding challenges.

As the case studies demonstrate, there are significant differences in farming and ecosystems among different HNV farming areas. Thus, different versions of the scheme should be tailored for areas with differing farming systems and ecosystems in conjunction with local farmers. Objectives and

Surveyed farm in North Connemara
Photo: Eamonn Delaney

Scrub encroachment in calcareous grassland on the Aran Islands
Photo: The Heritage Council

criteria will need to be tailored to take into account differences in the habitats and species present and their abundances in different biogeographical regions. Payment levels will also need to reflect differences in the ecosystems and farming enterprises that occur within HNV areas. It is imperative that an ecological monitoring and evaluation programme be built into an HNV farming AES at the earliest stages to ensure the scheme meets its objectives.

Although an AES or element of an AES targeting HNV farming should be available to farmland irrespective of nature conservation designations, taking designations into account when designing scheme objectives can provide added conservation benefits. Appropriate management of HNV farmland adjacent to a designated site may be of critical importance to its favourable conservation status, *e.g.* farmland adjacent to an estuary designated for wintering wildfowl that provides a critical feeding ground. Thus, designated sites should be considered when the options for each applicant farm are being agreed. This issue of connectivity will also be particularly important given the potential impact of climate change on the distribution of habitats and species and the need to cater for these changes in conservation planning.

Spring gentian* Gentiana verna *in calcareous grassland
Photo: Eamonn Delaney

Marketing HNV Produce

Proactive marketing of produce from HNV farmland is required to improve financial viability. Conservation-grade branding should be employed to obtain a premium price reflecting the biodiversity benefits and food quality of these farming systems. In many cases, advertising campaigns will be required to raise consumer awareness of conservation-grade produce, and producer groups should be formed to ensure consistent supply of quality produce. Local butchers should be established to facilitate this process, and State aid will probably be required to enable compliance with food safety regulations. The potential for diversifying farm enterprises to add value to conservation-grade brands and to support biodiversity should be investigated.

Next Steps

The case study results will be used to inform the development of policy advice by the Heritage Council. They are also the subject of ongoing work on HNV farming in Ireland by the European Forum for Nature Conservation and Pastoralism, with particular reference to the Aran Islands, north Connemara and the Iveragh Peninsula, supported by the Heritage Council. The operation of the recently implemented Burren Farming for Conservation Programme will also provide useful lessons in how such schemes can be designed and implemented in other HNV farming areas. This programme targets the delivery of a range of environmental benefits, in particular production of species-rich limestone grasslands and improvement of water quality, and aims to support HNV farming in the Burren, continuing and mainstreaming the findings of the BurrenLIFE Project.

Acknowledgements

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Monitoring the Restoration of Hay Meadows under Environmental Stewardship

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Providing incentives to conserve and restore habitats including species rich grasslands and other habitats is central to the Environmental Stewardship agri-environmental scheme in the UK. Neglected habitat may be restored to provide economic produce, provide opportunities for recreational walking, and provide biodiversity benefits from the conservation of habitat as functional landscape features and of constituent species. Measuring the effectiveness of such schemes can be aided by monitoring to provide immediate data to inform site managers, and longer term knowledge of habitat and species responses.

Environmental Stewardship aims to secure widespread environmental benefits and, of the schemes available in England, the Higher Level Stewardship has the objectives of wildlife conservation, maintenance and enhancement of landscape quality and character, natural resource protection, protection of the historic environment, and promotion of public access and understanding of the countryside.

Environmental Stewardship agreements for habitat and farm management may stipulate outputs in terms of land management operations to be undertaken, for example to cut an aftermath sward within a range of heights or to leave 10% of a meadow uncut for the benefit of over-wintering invertebrates. Agreements may also list outcomes in terms of reducing the quantities of undesirable species or features, or to increase species richness. Monitoring during the course of an agreement may aid the land manager in making decisions and provide information on the effectiveness of the management prescriptions.

Fryent Country Park is situated in the London Borough of Brent approximately 2 km north of Wembley Stadium. A remnant of rural Middlesex but now surrounded by the suburbia of north-west London, the 109 ha Country Park is a landscape of meadows surrounded by hedgerows with areas of woodland and ponds. Soils are dominated by the underlying London Clay, although one of the three hills within the Park is capped by pebble gravels. The Park is managed by Brent Council with the considerable involvement of Barn Hill Conservation Group, a registered charity (Barn Hill Conservation Group (2011)). Fryent Country Park was also entered into the earlier Countryside Stewardship scheme with an agreement from 1996-2006, which provided support for the conservation of hedgerows. Hedgerow length and area and the number of standard (timber-sized) trees have been surveyed once a decade since the 1980s. Total hedgerow length increased from 7.9 km in 1983, to 10.2 km in 1993 and 11.8 km in 2003; and the area of hedgerow habitat from 5.6 ha in 1983, to 7.4 ha in 1993 and 9.2 ha in 2003. Standard (timber-sized) trees will take several decades to approach the numbers (415) estimated to have been present prior to the outbreak of Dutch elm disease in the mid-1970s, reaching a low of 273 in 1993 with 285 in 2003. Pond restoration and creation, underway before the advent of Countryside Stewardship but continued under the scheme, led to a substantial increase in the population of the common frog. Environmental Stewardship at Fryent Country Park has focused on the restoration of meadows and their species richness, following several years during which the meadows were cut but the unharvested material was left on the ground.

Meadows at Fryent Country Park are surveyed annually for the frequencies of vascular plants and for plant species richness, while management records for each meadow enable investigation of the effectiveness of management treatments. Of the 23 meadows which form the core of the database, the aim is to survey at least half annually. In each meadow, species presence is recorded in each of 10, one metre-square quadrats. Quadrat locations are randomised as far as practicable, but permanent quadrats are not used to avoid the potential for interference and, in particular, any risk to harvesting machinery. Surveying is undertaken in the second-half of June with Barn Hill Conservation Group undertaking much of the work. Typically there will be 20-40 plant species in each field, although over 200 species have been recorded from the meadows in total. Data storage

Fryent Country Park ***Photo: Leslie Williams***

uses Microsoft Access for the species data; and Microsoft Excel spreadsheets for the data relating to the physical features and management of each field and which collectively form the farm/park management records.

The method provides a range of information, for example, on species associated with particular National Vegetation Classification communities (see Rodwell 1992) such as the MG1 (*Arrhenatheretum elatioris* grassland) and MG4 (*Alopecurus pratensis – Sanguisorba officinalis* grassland) present within the meadows, on species susceptibility to weather and climatic variations (*e.g.* some grasses and annual vetches such as common vetch *Vicia sativa*, hairy tare *V. hirsuta* and smooth tare *V. tetrasperma*), and the effects of meadow management on species richness and of species composition. Data from earlier years of the monitoring had shown that the species richness per square metre had averaged 9.2 for meadows that were harvested for hay, 8.1 for meadows where the hay had been flail cut but left on the ground, and 6.1 for meadows that had been uncut.

Similarly the data provides an early warning of increases in problem species. Ragworts are immediately removed if found, and tend to be associated with disturbed ground, while the data informs the annual Borough review under the Ragwort Control Act. More prevalent is blackthorn *Prunus spinosa*, both suckering from field edges and as seedlings in meadows, and the creeping thistle *Cirsium arvense* (Table 1). High frequencies of creeping thistle render the crop unattractive to farmers. However, two or three cuts within one year are effective at reducing the frequency of creeping thistle (Williams and Mercer 2002). Thus, early warning in the June surveying enables a further cut to be programmed a couple of months after the hay harvest, and if necessary for a third, or aftermath cut in the late summer/early autumn.

Table 1. Average change in creeping thistle frequency for each year for five treatment cases (Note: sample sizes varied)

Harvesting and/or treatment in previous year	Number of cuts per year	Average change in creeping thistle frequency per year
Meadow not cut	0	+ 13.3 %
Flail cut without harvesting	1	+ 1.4 %
Hay harvested	1	+ 1.1 %
Hay harvested and Aftermath cut	2	- 15.9 %
Spring cut, Hay harvested and Aftermath cut	3	- 30.0 %

It is widely considered that a build-up of a matt of thatch at ground level, particularly evident if a meadow is left uncut or cut without harvesting, leads to a reduction in plant species richness. The thatch is considered to physically smother and hinder the growth of some species, and may be more influential in reducing plant species richness than any increase in nutrient levels from the decomposition of the plant remains. Harrowing is a treatment specified in the Environmental Stewardship agreement, aimed at breaking up and reducing the matt of thatch at ground level and hence increasing the plant species richness. While the '10% thatch' stated in the agreement is the 10-year aim, the plant species richness increased in 2010 to 10.6 species per square metre, as compared with a range of between 7.3 and 8.9 during the previous decade. The cover of thatch is difficult to measure, but estimates have been made for each quadrat during the past three years. While it is too early to draw conclusions due to a range of factors involved, the ground cover of thatch reduced following the re-introduction of hay harvesting and a trial year of harrowing (Table 2).

Table 2: Percentage ground cover of thatch

	Date of survey	Estimated ground cover of thatch (minimum sample of 13 meadows)
Following several years of flail cutting	June 2008	77%
Following re-introduction of hay harvesting in summer 2008	June 2009	62%
Following hay harvesting in summer 2009 and harrowing in autumn 2009	June 2010	40%

Effective monitoring based on a valid and repeatable method, can provide long-term information, and can also be used to provide immediate knowledge for land managers to inform decisions on management in the following season.

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Hay harvest at Fryent Country Park
Photo: Leslie Williams

Is 'The Crop Protection Industry' Creating Another Silent Spring?

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Introduction

The purpose of this article is to raise awareness among environmental professionals about the threat from currently used insecticides, in particular neonicotinoids. This threat must be of concern to anyone committed to nature conservation and biodiversity. Until recently, little has been published on this subject since these insecticides were introduced 20 years ago. Perhaps other issues appeared more urgent, such as habitat loss or climate change, and took precedence. Despite all the investment of time, money and expertise from governments, professionals and the interested public, biodiversity has nevertheless continued to decline in the UK over the last 50 years and the countryside has continued to become impoverished in quality. Schemes were established to conserve diversity, such as compulsory set-aside. Despite the many wildlife benefits associated with set-aside, this was abolished in 2007 and replaced by a reduced industry-led voluntary scheme.

Pesticides

Since 1945 or so, it has become customary in Europe and America for farmers to apply chemicals to their field and crops, in the form of fertilisers, pesticides, and herbicides. This 'Golden Age of Discovery' has been the source of most of our current insecticides (Casida and Quistad 1998). Agriculturists viewed pesticides as a panacea, and some other long-used control methods (such as crop rotation and similar cultural controls) were abandoned in favour of applying ever-increasing quantities of pesticides that were seen to increase and ensure productivity.

The manufacturers these days now call themselves the 'Crop Protection Industry' or 'The Plant Protection Industry'! Nevertheless the pests are still with us. 'Indeed' as Julian Huxley wrote 'the very idea of extermination is unecological. It is almost certainly impossible to exterminate an abundant insect pest, but quite easy to exterminate non-abundant non-pests in the process'[1].

The word 'pesticides' is a useful general term for chemicals used by man to kill plants and animals. For the purpose of this particular article we are focusing on just one branch of these chemicals: insecticides, those intended to kill insects. The four major groups of insecticides which dominate the world market are pyrethroids, organophosphates, methylcarbamates and neonicotinoids.

The First Insecticides

Some early pesticides, such as arsenic and chlorine, and DDT (dichlorodiphenyltrichloroethane) introduced in 1939, and the later organophosphates, methylcarbamates, and pyrethroids - all neuroactive chemicals - were extremely effective in dealing with pests but they were also found to produce other undesirable and often destructive side-effects.

The first public alarm about pesticides was sounded in 1962, even though American farmers had been spreading thousands of tons of the insecticide DDT during the 1950s and 60s. Rachel Carson, the distinguished American biologist, environmentalist and journalist, published her book *Silent Spring* to challenge their widespread use, by giving well-researched and dramatic evidence of huge devastation of the American countryside by pesticides. She established the link to waning bird populations, as DDT made its way through the food chain in ever-more-concentrated doses[2]. The US banned DDT in 1972 and this resulted in reversing the decline of raptors. In Britain, severe declines in populations of peregrine falcons and sparrow hawks became a *cause célèbre* for conservation (Wilson 2009). The grey partridge *Perdix perdix* remains the species for which the most incontrovertible evidence exists for pesticide-related decline[3]. Carson's book roused a storm of public protest and raised awareness of these and other dangers to the environment, as a wake-up call to ecological sensitivity. It continues to be referred to widely even if less well-read in detail. The result of the book was that controls and bans were introduced on DDT in many countries, and worldwide under the Stockholm Convention (but is still in use in parts of the world).

After Silent Spring:

The Neonicotinoids - Imidacloprid, Clothianidin and Thiamethoxam

Chemical companies have invested in developing alternatives with lower doses and more subtle effects, seemingly less harmful to the environment[4]. Agricultural use of insecticides has increased enormously, especially for the aim of 'plant protection', but

'most currently used insecticides and other chemicals for control of invertebrate pests in both agriculture and public health act through interference with the nervous system. As such they present few problems of phytotoxicity, but of all pesticides they present the greatest acute risk to the health of human beings and fauna in the environment' (Carlile 2006).

The neonicotinoids are a new class of insecticides, available since 1993 (Moffat 1993). Henk Tennekes, a Dutch toxicologist, has recently published a book, *The systemic insecticides: A Disaster in the Making*. He writes:

'Neonicotinoids are revolutionary because they are put inside seeds, and permeate the whole plant because they are water soluble, which is why they are called systemic insecticides. Any insect that feeds on the crop dies. The neonicotinoids may seem ideal insecticides because application rates are much lower than for older, traditionally used, insecticides, but, unfortunately, there are catastrophic disadvantages as well. Any bee or butterfly that collects nectar or pollen from the crop is poisoned. Neonicotinoids bind irreversibly to critical receptors in the central nervous system of insects. The damage is cumulative, and with every exposure more receptors are blocked.' Tennekes (2010)[5].

Many other non-target insect visitors, such as beetles, flies, moths, ants, in addition to bees and butterflies, get a dose of insecticide *every* time they visit a plant for nectar or pollen. Also when

imidacloprid is applied as systemic insecticide to the soil around trees it may cause adverse effects on earthworms.

Though these chemicals are intended to 'protect' crops from attack by 'pest' insects which might threaten maximum crop yield, unfortunately, many non-target species are also affected, in other words *many other invertebrates* beyond cropped lands.

Tennekes claims that neonicotinoid insecticides, such as imidacloprid, clothianidin and thiamethoxam, 'are persistent and mobile in soil, soluble in water and stable to breakdown by water at neutral pH'. As a result of these properties, the compounds have 'high leaching potential' and, in addition, imidacloprid degrades with a half-life of 355 days in some basic solutions, *i.e.* persists for nearly a year.

It is in the Netherlands in particular that evidence is being gathered and publicised in order to expose the dangers of these substances (Tennekes 2010). Since 2004, major contamination of Dutch surface water with imidacloprid has been detected by the Water Boards, particularly in the western part of the country. The effect of this is the killing of non-target insect species and other arthropods and so reducing invertebrate prey for birds and other species.

Non-Target Species: Bees

Beekeepers in a number of European countries have reported large losses of honeybees after nearby use of these neonicotinoids. The effects seem to appearing widely in Europe and the United States of America. Panic about honeybee colonies collapsing, empty hives, a dearth of honey, and a shortage of pollinators for California's almond crop has reached the media. This phenomenon has been called 'honey bee vanishing' or Colony Collapse Disorder (CCD). These terms describe a state where the bees seem to lose their navigation systems (the forager bee stage), which disrupts the working order of the bees within the hive. Many theories have been suggested for this including stress factors such as varroa mites, loss of habitat and climate change (Ratnieks and Carreck 2010). However agrochemicals, particularly neonicotinoids, appear to be implicated because many CCDs appear to have occurred following spraying of fruit trees and other plants attractive to pollinating insects, including oil seed rape (particularly attractive to honeybees). Pollen and nectar contaminated by insecticides are brought back into the hive, fed to the developing brood, and consumed by all inhabitants of the hive – so the whole 'superorganism' is weakened and more vulnerable to pathogens and parasites. A recent study demonstrates that the interaction between the microsporidia *Nosema* and a neonicotinoid significantly weakened honeybees (Alaux *et al.* 2010). For a thorough discussion of the puzzle of honeybee losses see Maini *et al.* (2010)[6]. There is another controversy emerging about 'guttation', the drops of plant-sap on leaves, (excretion of xylem fluid at leaf margins) such as grasses (including maize, wheat, barley, *etc.*). When bees consume guttation drops, collected from plants grown from neonicotinoid-coated seeds, they die within a few minutes (Girolami 2009). Imidacloprid, Clothianidin and other neonicotinoid pesticides are systemic - and present in the rising sap of the plants - the pesticides are expressed in these droplets.

Four European countries have already suspended the sales of neonicotinoid pesticides to a 'greater or lesser degree', two countries having banned the sale following massive honeybee kills associated with their use. One neonicotinoid insecticide launched in 1994, Gaucho®, having imidacloprid as its active compound, has been banned for use on sunflowers in France since 1999 (Bonmatin *et al.* 2004)[7]. In the UK however, a Defra spokesperson in October 2008 said that there were no plans to ban the pesticides in the UK. The Soil Association (2010) has taken up the cause and urged the UK Government to ban pesticides linked to honeybee deaths around the world[8]. Buglife and other environmental organisations are calling for a review and a precautionary suspension in the licensing of neonicotinoid insecticides for use in the UK, on the basis that they are considered damaging to bumblebees, honeybees and other non-target invertebrates. A report published by Buglife in 2009 highlights that the current process for approving crop pesticides is inadequate for assessing risks to bees and other invertebrates[9]. Scientific evidence Buglife presents shows that bees which eat nectar and pollen contaminated with imidacloprid (the commonest neonicotinoid) then forage less and produce fewer offspring. Other research has shown that certain imidacloprid levels in rivers can cause deformities in growing mayflies.

Butterflies

Butterfly Conservation warn that most butterflies continue to face serious long-term decline[10]. While loss of habitat has been a significant factor, it appears that with the development of insecticides after Carson there was insufficient study of their wider effects in the field, which were not considered significant. We quote from the *Millennium Atlas of Butterflies in Britain and Ireland*, published in 2001:

'The decline of butterflies is also commonly blamed on the use of pesticides, but there is little evidence for this assertion. Few important butterfly habitats are deliberately sprayed with pesticides, most of which are directed at crop monocultures that contain no larval food plants. The exceptions are field margins which are often the refuge of many wider countryside species in intensively farmed landscapes.'

A paper by Davis *et al.* (1991) had investigated the hazards of insecticides to butterflies of field margins, *i.e.* prior to imidacloprid (introduced after 1991). They found it was not generally possible to dissociate the direct effect of insecticides on butterflies from the indirect effects which herbicides may have in eliminating larval food plants, or reducing the abundance of nectar-bearing flowers for adults. They quote Sotherton *et al.* (1985) that the latter is more likely to be responsible for reduced adult butterfly counts in field margins.

Since the introduction of neonicotinoids from 1993, to quote Tennekes (2010) on imidacloprid: 'Any bee or butterfly that collects nectar or pollen from the crop (or any affected plant - *our words added*) is poisoned.' Figure 1 shows the decline of butterflies in the Netherlands since 1992. Therefore these insecticides may be having even more significant impacts now than those identified in the paper by Sotherton *et al.* in 1985 and shown as 'little evidence' in the Butterfly Atlas in 2001. In addition to the nectar and pollen poisoning of pollinating butterflies there is the issue of spray-drift, and the leaching of these water-soluble insecticides into the adjacent field margins, which house and feed butterflies at all life-cycle stages.

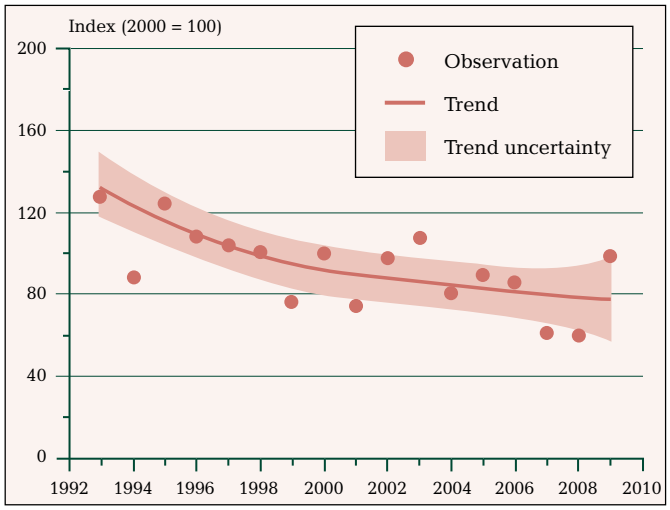

Figure 1. The decline of day butterflies in the Netherlands since 1992
Source: Netwerk Ecologische Monitoring (NEM) [CBS (Dutch Central Statistics Office), Vlinderstichting (Butterfly Foundation)]

Birds

Agricultural change has caused farmland bird population declines and other biodiversity losses in agricultural systems. Wilson *et al.* (1999, quoted in Wilson *et al.* 2009) reviewed impacts of agricultural change on those invertebrate and plant groups that are important components of the diet of 26 seed eating farmland birds of western Europe (gamebirds, pigeons, larks, corvids, finches, sparrows and buntings). Many of the bird species concerned rely on invertebrates as a protein-rich food source for chicks, and here Wilson *et al.* (1999) found that grasshoppers, sawflies, spiders and leaf beetles, four invertebrate groups that are highly sensitive to insecticide usage, all formed part of the diet of declining bird species. Overall, the review concluded that pesticide usage, intensive cultivations and loss of uncultivated field margin habitats on arable land, coupled with agricultural improvement of grassland through drainage, reseeding and fertilization, were likely to have combined to reduce the availability of key seed and invertebrate food for birds on farmland.

To clarify, Tennekes (2010) describes three main mechanisms through which these pesticides affect food for farmland birds. The use of:

1. insecticides may deplete or eliminate arthropod food supplies which are exploited by adults and their dependent young during the breeding season;
2. herbicides may reduce the abundance of, or eliminate, non-crop plants that are hosts for arthropods taken as food by farmland birds during the breeding season; and
3. herbicides may also deplete or eliminate weed species, which provide either green matter or seeds for herbivorous or granivorous species respectively.

All three of these mechanisms reduce the survival and breeding productivity of farmland birds.

Flawed Licensing and Scientific Study

In European countries the initial licensing is done at European Union level by way of a Draft Assessment Report (DAR), but although the basic research for it is usually done by independent scientists, the organisation of the report – remarkably, you may think – is carried out by the manufacturer. So the DAR for the commonest neonicotinoid, imidacloprid, was put together by Bayer, which makes imidacloprid, and which makes many millions of pounds from it every year. Bayer's report found no reason why it should not be approved.

In the USA, the Environmental Protection Agency has been accused of covering up a 'critically flawed' scientific study which suggests that 'there may be imminent hazards to honeybees posed by continued use of clothianidin, the pesticide in question'[11]. The organisations Pesticide Action Network and Beyond Pesticides joined beekeepers from around the USA in calling on the EPA to pull the neonicotinoid (one of Bayer Crop Science's top-selling pesticides) clothianidin, which is linked with Colony Collapse Disorder, off the market immediately[12, 13]. Of 94 pesticide active ingredients released since 1997, 70% have been given conditional registrations, with unanswered questions of unknown magnitude.

Potential Impacts on Mammals, Including Humans

In a recent paper by Duzguner and Erdogan (2010), their results indicate that 'imidacloprid, which has been widely used for flea and crop insect control, may cause acute health damage in non-target organisms leading to oxidative stress and inflammation. Therefore further investigations should be performed on this insecticide to assess its possible risk to humans and other mammalian species.'

Defra Consultation, UK[14]

In February 2010 there was a consultation on the implementation of the new EU Directive on the Sustainable Use of Pesticides (SUD) (designed to reduce the risk of harm to humans and the environment from the use of pesticides). Notably, the British Medical Association was amongst those recommending that it should be a requirement to provide advance notice of spraying events, in order to protect vulnerable individuals, such as those with respiratory problems. In a disappointing reply to the consultation, Defra failed to address health and environmental concerns and committed the Government to very little beyond some minor changes to meet new requirements. Defra claimed no compelling evidence was provided in the responses to justify further extending existing regulations and voluntary controls[15]. Further consultation will take place next summer to ensure that new legislation is in place by November 2011.

Lord Henley, Farming minister, said: "We have to protect the public and the environment from harm, and we'll do so by following sound scientific and other robust evidence. By making a small number of changes to our existing approach, we can continue to help feed a growing global population with high-quality food that's affordable, while minimizing the risks of using pesticides."

We put the question: Is it really the intention of the Government and/or Defra to 'feed a growing *global* population', given the limited land use availability and population of the crowded UK, and at the same time maintain the ecological diversity of the landscape?

Pesticide Action Network UK (PAN UK)

PAN UK, the coordinated pesticide pressure group, has been calling on the UK Government to adopt a range of measures under the SUD that would see the UK at the forefront of pesticide regulation in Europe[16]. PAN UK requests:

- a targeted-use reduction of pesticides deemed to be toxic to bees and other pollinator species;
- a prohibition on the use of pesticides in areas frequented by vulnerable groups such as parks, hospitals and schools; and
- mandatory prior notification of spraying events[17].

Alternatives to Management by Pesticides

Integrated Pest Management (IPM) was endorsed by UNCED (1992) as part of Section 14 ('promoting sustainable agriculture and rural development') as 'the best option for the future, as it guarantees yields, reduces costs, is environmentally friendly and contributes to the sustainability of agriculture' (UNCED 1992, paragraph 14.74)[18]. IPM may use both pesticides and biocontrol (*i.e.* arthropod predators and fungal species) to control pest species. Practitioners of IPM must be aware of the potential harmful effects of insecticides on these arthropods, which may eliminate beneficial predatory invertebrates of pest species (Winston 1999). A comparison of methods and costs, of using biologically based alternatives to replace some pesticide use, is covered in the 1993 book *The Pesticide Question* by Pimentel and Lehman.

Summary

The increasingly widespread use of neonicotinoid insecticides in agriculture presents a so far little-recognised threat to the natural world with its interlocking ecological systems on which human health and survival depends. In this article we have collected together information from a number of published sources, from books, journals, newspapers and reports from government and other organisations. We have pointed to research which shows destructive

effects on non-target invertebrates (bees, butterflies and other vital pollinating insects), on birds, particularly those invertebrate-dependent for their food supplies, and warn of the potential threat to wild mammalian species. Soil and water can be widely contaminated through leaching and persistent residues. Based on all this research we argue strongly for urgent changes in regulatory policies regarding pesticide registration, use and monitoring procedures as they relate to pollinator safety.

Notes

[1] Julian Huxley in Preface to Carson's *Silent Spring*, 1962.

[2] DDT caused eagle eggshells to become thin and the eggs to become sterile.

[3] A review of indirect effect of pesticides on birds, RSPB Research Report no 28, April 2008.

[4] The differences between the insecticides are: *Organochlorines* (DDT) were stable in water and soil, but caused environmental problems. *Organophosphates* and *carbamates* are readily degradable in water and soil, but are highly toxic to mammals, *Neonicotinoids* are not readily degradable in water and soil, but of low toxicity to mammals. 'The difference, though, is that imidacloprid and clothianidin are at least 7,000 times more toxic to honeybees, or any other insect for that matter, than DDT, (and I am only talking about acute toxicity here, the differences are even greater when it comes to chronic toxicity to insects). Now, admittedly, you need less of the neonics, because they are systemic but they easily leach from soils and spread through the environment killing non-target insects.' (Tennekes *pers comm*).

[5] 'Target site in insects is an insect's neuronal synapse where electrical impulses are transmitted from one cell (pre-synapse) to another (post-synapse)' *Syngenta Entomology 101*.

[6] Maini *et al.* (2010) The puzzle of honeybee losses: a brief review. *Bulletin of Insectology* **63:** 153-160.

[7] Classes of Neonicotinoids and Trade Names: Acetamiprid (Assail®, Intruder®), Clothianidin (Poncho®, Clutch®) Imidacloprid (Gaucho®, Admire®, Provado®) Thiamethoxam (Actara®, Centric®, Cruiser®, Platinum™) *Syngenta Entomology 101*.

[8] Soil Association: www.soilassociation.org

[9] Buglife Report: www.buglife.org.uk/Resources/Buglife/Neonicotinoid%20insecticides%20report.pdf

[10] Butterfly Conservation: www.butterfly-conservation.org

[11] Leaked EPA Memo: www.panna.org/sites/default/files/Memo_Nov2010_Clothianidin_0.pdf

[12] According to the leaked EPA memo, clothianidin's registration is based on a flawed field study that was subsequently downgraded to a 'supplemental' category that amounts to 'interesting, but not enough to base a decision on'. Clothianidin (product name Poncho®) has been widely used as a seed treatment on many of the US's major crops for eight growing seasons under a 'conditional registration' granted in 2003 while EPA waited for Bayer to conduct the field study assessing the insecticide's toxicity to bees - the study that now appears to be too flawed to rely on.

[13] Beyond Pesticides: www.beyondpesticides.org

[14] www.defra.gov.uk/corporate/consult/pesticides/index.htm

[15] Responses: ww2.defra.gov.uk/news/2010/12/15/pesticides/

[16] The SUD is a progressive piece of EU legislation designed to reduce the risk of harm to humans and the environment from the use of pesticides. The Articles contained within the SUD covered a wide range of issues including training, information provision to the public, minimising and prohibiting the use of pesticides in specific areas and integrated pest management (IPM). The SUD is not a binding EU law but is open to interpretation on how it is implemented by individual Member States, although they must adhere to the spirit and meaning of the Directive and meet the required aims of the Directive.

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Reassessing Habitat Translocation as a Tool for Delivering New Nature Conservation Priorities and for Conserving Ecological Resources

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Habitat translocation is a process that has been shunned by nature conservation for some 20 years. There has been a deep rooted suspicion amongst conservation ecologists that it is a panacea which too easily allows the development of sites that contain important ecological features. The lack of good evidence for success in habitat translocation projects in the 1980s (Byrne 1990) formed a very powerful part of the evidence base that ensured that sites of importance for nature conservation were not simply moved if they were in the way of a proposed development. The risks of failure as demonstrated by Byrne's review contributed to the evolution of official UK policy on habitat translocation by the statutory nature conservation agencies (JNCC 2003).

This paper urges a reassessment of the role of habitat translocation to recognise its benefits to nature conservation, when used with pragmatic safeguards, as a method of last resort to rescue or salvage ecological features and associated ecosystem services and use these at other locations as part of habitat creation or habitat restoration schemes. The impetus for such a reassessment comes from two recent reviews of nature conservation priorities in the UK. The priority policy options and research needs for nature conservation in the UK have been identified in a collaborative assessment involving both academics and representatives of governmental and non-governmental organisations (Sutherland *et al.* 2010). The Lawton report *Making Space for Nature* (Lawton *et al.* 2010) sets out a wide-ranging set of recommendations in order to achieve a coherent and resilient ecological network of wildlife sites across England that can meet future challenges, including climate change, and deliver real benefits to wildlife and people.

The delivery of the land use policies identified in these reviews such as habitat banking, 'no net loss' of biodiversity, ecosystem services, restoring floodplain functionality, peatland restoration and ecologically coherent networks is generally seen in terms of habitat creation, habitat restoration and habitat enhancement. Habitat translocation rarely appears in the same context but delivering these policies will require this process as well. For example, the logic of a 'no net loss' policy suggests that valuable habitats on development sites will have to be translocated because new habitats of the same maturity and quality cannot be developed fast enough to replace the loss of mature habitats to development projects.

We already translocate vegetation and the associated sediments to kick start a new colonisation process in the creation of new ponds and wetlands (*e.g.* reedbeds). But there are real concerns that habitat translocation can be used as a way of facilitating a planning application by demonstrating that a habitat on a site can be moved to a new location and is not therefore a material constraint to development. We should accept the challenge of this argument and ensure that compensation measures such as habitat translocation are methods of last resort to be used when avoidance and mitigation are not sufficient to prevent loss of biodiversity.

Project planning should begin with the avoidance of loss or disruption to designated sites and habitats that comprise critical natural capital. Important ecological features (such as multi-species hedges, veteran trees, species-rich grassland, ponds) should be retained wherever practicable in the scheme

Photo A. Surface water balancing pond in Telford with little emergent vegetation

Photo B. Digging up rhizomes of common reed from an established reedbed prior to translocation

Photo C. Common reed has spread extensively to create reedbeds whose extent is limited by the water depth

layout. However, incorporation of important ecological features may not be possible because of physical constraints to site access, design or layout, or commercial and financial reasons. If avoidance is not possible, these features can be re-created if their nature conservation value is such as to require compensation for their loss. The long-term ability of habitat creation to deliver mature and functioning habitats is not in question. However, such re-creation often requires time - decades or longer - to develop the flora and fauna associated with such habitats. The short-term loss of existing habitats and their replacement by young and species-poor habitats is contributing to the ongoing loss of biodiversity and the associated ecosystem services.

An alternative to habitat creation is to translocate the ecological features to different locations within a site – or to another location where environmental conditions are similar (*e.g.* soils, topography, hydrology). Habitat translocation usually provides complex mature habitats more quickly than creating the same habitat in the same location by planting and sowing. It also allows the use of native species of local provenance to be used rather than imported plants. Using ecological features that would otherwise be lost during site clearance operations is an effective and economic way of retaining biodiversity, albeit in different locations. Clearing vegetation from sites is the first action that a developer undertakes. The clearance requires just the sort of large plant and machinery that is suitable for moving small trees, hedges, areas of vegetation and for remodelling the local topography or digging new ponds and scrapes and watercourses.

Habitat translocation can also deliver ecosystem services – those services that biodiversity provides to society which have an economic value. For example, a translocated hedge can provide ecosystem services, such as a wildlife corridor, habitat connectivity, landscape structure and visual screening, and a windbreak, whereas a newly created hedge will take many years to develop the same level of services.

There are risks of failure in moving habitats, as there are with habitat creation, but reasons for success or failure in habitat translocation are starting to be understood in both a general sense (Bullock 1998, Anderson and Groutage 2003, Box 2003) as well as for specific habitats (Trueman *et al.* 2007, Box *et al.* 2010, Box and Stanhope 2010). Habitat translocation has been undertaken as part of recent major projects *e.g.* Heathrow Airport Terminal 5 (Palmer and Wilbraham 2008) and London 2012 Olympic and Paralympic Games (Wansbury and Jackson 2010). The key issues are matching the environmental context of donor and receptor sites, moving the habitat using an appropriate translocation methodology at the ideal time of year, and ensuring habitat management and monitoring for periods of time that allow translocated habitats to develop both maturity and complexity as with habitat creation.

Safeguards to the use of habitat translocation are provided by official UK guidance on a) the circumstances for the use of habitat translocation and b) the use of the hierarchy of avoidance, mitigation and compensation in relation to biodiversity and planning applications. Current official guidance is that habitat translocation is not an acceptable alternative to *in situ* conservation; however, in certain circumstances, habitat translocation could be used for habitat restoration where there is a net gain for biodiversity (JNCC 2003). Government planning policy for England in relation to biodiversity is set out in PPS 9 and includes the hierarchy of avoidance, mitigation and compensation as a key principle to prevent harm to biodiversity (and this is expanded on in the accompanying joint Circular and guide to good practice). Comparable advice is available in Northern Ireland (PPS 2), Scotland (NPPG 14) and Wales (TAN 5).

A comprehensive set of principles to underpin an effective system of compensation for loss of ecological features during development is set out by Lawton *et al.* (2010, section 6.4.3). A summary of these includes:

- Avoidance, mitigation, compensation hierarchy.
- Compensation for unavoidable impacts and not a 'licence to destroy'.
- Compensation to achieve a net gain for biodiversity.
- Long-term benefits require long-term management.
- Certain habitats cannot be re-created.
- Receptor areas cannot be existing high value habitats.
- Multiplier ratios required to achieve net benefit for biodiversity.
- Create large habitat areas through pooling compensation from different developments.

These habitat compensation principles are just as applicable to habitat translocation as to other methods of achieving biodiversity compensation such as habitat creation. Such principles should be included in the official UK guidance for both habitat translocation and planning policy for biodiversity when these are revised.

In addition, the costs of a translocation process with a high probability of success, including land purchase and subsequent management and monitoring, are probably proportional to the nature conservation value of a habitat. In other words, it is relatively cheap to dig up and move a hedge but expensive to move a high quality species-rich grassland. The cost of habitat translocation is in fact acting as a proxy for the economic value of nature. Such costings favour the retention of habitats of high nature conservation value and the moving of habitats of lower nature conservation value. The costs of habitat translocation

Photo D. Moving a section of hedgerow in September prior to earthworks operations

Photo E. The translocated hedgerow the following July

could be included in habitat banking schemes (Briggs *et al.* 2009, www.environmentbank.com) in a similar way to those of habitat creation or restoration.

The need to look afresh at habitat translocation is due to the changing policy context for nature conservation, in particular the potential for 'no net loss' of biodiversity in development control policies and the requirement for effective techniques and safeguards to compensate for the unavoidable loss of biodiversity during development and other land use changes. This reassessment of habitat translocation has led to the identification of both policy issues and research topics for ecological research that need to be addressed (see separate textbox).

In conclusion, habitat translocation is a process that can be used to rescue or salvage habitats and associated ecosystem services that might otherwise be lost to a development project and move them to other locations within a site or off-site. A comprehensive set of principles is required to ensure that there is 'no net loss' of biodiversity during the development of a site as well as safeguards for compensation measures for unavoidable habitat loss. This requires engineers, planners and developers to work together with ecologists and environmental managers to define how and when to translocate habitats with the greatest chance of success and to minimise the risk of failure. The challenge for nature conservation is to recognise that land use policies such as habitat banking, 'no net loss' of biodiversity, and coherent and resilient ecological networks cannot be delivered without using habitat translocation together with habitat creation, habitat restoration and habitat enhancement.

Policy issues and research topics for habitat translocation

Policy issues

a) The Joint Nature Conservation Committee (JNCC) and the UK statutory nature conservation agencies should look again at the 2003 guidance on habitat translocations and update this in light of current nature conservation policy reviews and the need to conserve ecological resources.

b) Revisions to official guidance on biodiversity and nature conservation and planning policy in the UK (PPS 9, TAN 5, NPPG 2 and PPS 2) should make explicit reference to the use of habitat translocation together with habitat creation, habitat restoration and habitat enhancement.

c) Revisions to official guidance on planning policy and biodiversity should include a comprehensive set of principles to underpin an effective system of compensation for loss of ecological features during development such as those set out by Lawton *et al.* (2010, section 6.4.3).

Research topics

a) Establish robust criteria to define success in habitat translocation.

b) Investigate notable habitat translocation schemes undertaken in the late 1980s and 1990s and identify potential reasons for success or failure.

c) Establish evidence to define the probability of success in habitat translocation of different habitats using different translocation methodologies.

d) Propose and assess novel habitat translocation methodologies.

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Ecology Legislation Update

Supreme Court rules on the Habitats Directive 'deliberate disturbance' offence and comments on planning authorities' duties to European Protected Species

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In my last *In Practice* article I reviewed the Court of Appeal decision of June 2010 in the case of *Vivienne Morge vs Hampshire County Council* [2010] EWCA Civ 608.

The *Morge* decision focused on the legality of a planning decision to allow a new bus route through bat habitat.

This article contains an important update following the Supreme Court's decision in the Morge case handed down on 19 January 2011. This article focuses on the two issues which the Supreme Court commented upon:

1. the meaning of the Art 12(1)(b) Habitats Directive 'deliberate disturbance' offence; and
2. how local planning authorities (LPAs) should discharge their legal duty to have regard to the requirements of the Habitats Directive.

The European Protected Species 'deliberate disturbance' offence

Art 12(1)(b) of the Habitats Directive provides that:

'Member States shall take the requisite measures to establish a system of strict protection for the animal species listed [*i.e.* European Protected Species] in their natural range, prohibiting….(b) deliberate disturbance of these species, particularly during the period of breeding, rearing, hibernation and migration.'

The Court of Appeal decision of 2010 contained a very 'conservative' interpretation of this offence and set a high threshold for triggering it. The Court stated (in summary) that a disturbance would need to affect the conservation status of the species at population level and biogeographic level in the long-term in order to fall within the Art 12(1) 'deliberate disturbance' offence. The Court held that the facts of the Morge case did not trigger this offence. This judgment would have made welcome reading for many developers, particularly wind farm developers.

The Supreme Court, however, has overruled the Court of Appeal, giving a more balanced interpretation.

'Deliberate'

First the Supreme Court has confirmed what 'deliberate' means:

'As stated by the Commission in para 33 of its Guidance, "deliberate' actions are to be understood as actions by a person who knows, in light of the relevant legislation that applies to the species involved, and the general information delivered to the public, that his action will most likely lead to an offence against the species but intends this offence or if not consciously accepts the foreseeable results of his action.' Put more simply a deliberate disturbance is an intentional act knowing that it will or may have a particular consequence, namely disturbance of the relevant protected species.'

This is helpful clarification of the word 'deliberate', and is applicable to all the European Protected Species (EPS) offences which contain this term. As I often advise, a person will not commit the Art 12(1)(b) offence where they disturb an EPS but do not do so 'deliberately'. It follows from the meaning of 'deliberate' that where an activity is judged unlikely to lead to disturbance of a EPS (*i.e.* based on survey data and (perhaps) proposed mitigation (avoidance) measures, the risk of disturbance occurring is low), then if disturbance does unexpectedly occur it is unlikely that that disturbance can be said to have occurred 'deliberately'. It also follows that if, following completion of a development (such as a wind farm), it becomes clear that an EPS (*e.g.* bats) is being killed or disturbed by the development then the operator may well be said to be deliberately killing or disturbing the EPS by allowing that activity to continue in the same manner.

'Disturbance'

Secondly the Court has given its view on the meaning of 'disturbance'.

It has adopted a more cautious approach than the Court of Appeal. It agreed with the Court of Appeal that the provision relates to protection of the species (not specimens of the species) and that the disturbance does not have to be 'significant' to come within the offence. However, it stated that the Court of Appeal had set the threshold too high in ruling that 'deliberate disturbance' requires an impact 'on the conservation status of the species at population level' or an impact which 'affects the survival chances of a protected species'.

Beyond that, the Supreme Court was reluctant to state what the minimum threshold for 'deliberate disturbance' of the species would be, although it did cite the EU Commission's guidance referring to the need for the disturbance to be 'harmful'. The Court made a number of further comments as guiding principles to assist in the interpretation of the offence:

- each case has to be judged on its own merits; and a species by species approach is required;
- even with regard to a single species the position might be different depending on the season or on certain periods of its life cycle;
- consideration should be given to the rarity and conservation status of the species and the impact of the disturbance on the local population of a particular protected species;
- individuals of rare species are more important to a local population than individuals of a more abundant species;
- disturbance to species that are declining in numbers is likely to be more harmful than disturbance to species that are increasing in numbers;
- disturbance during the periods of breeding, rearing, hibernation and migration is more likely to have a sufficiently negative impact on the species to constitute disturbance, but the offence leaves open the possibility that disturbance at other less sensitive periods could still potentially amount to 'deliberate disturbance'; and
- the Court strongly supported the EU Commission's guidance on the issue (found in the 'Guidance document on the strict protection of animal species of Community interest under the Habitats Directive 92/43/EEC' (February 2007)).

On the one hand this ruling may appear rather unhelpful because of its failure to set a minimum threshold. But on the other hand it is extremely difficult to create a 'one size fits all' definition of deliberate disturbance and one can sympathise with the predicament in interpretation which faced the Supreme Court.

The conclusion I draw is that the 'deliberate disturbance' offence is to apply to an activity which is likely to impact negatively on

the demography (survival or breeding) of the species at the local population level. In order for a disturbing activity to affect a species then clearly individuals need to be affected and it must follow that disturbing one or two individuals of a species is not necessarily below the threshold (*i.e.* outside the offence) because for a rare species, a species in decline, or a species at the edge of its range, a harmful disturbing impact on a very small number of individuals may still impact negatively on the demography of the local population. Ultimately the Court however has confirmed that the judgement is one for the relevant decision-maker to make (*e.g.* the licensing authority or the LPA), based on all the facts of the case.

Comment on the duty of LPAs to 'have regard to the requirements of the Habitats Directive' in discharging their functions

The Court of Appeal decision set out very clearly the way in which LPAs should discharge their legal duty under regulation 9(5) of the Conservation of Species and Habitats Regulations 2010 to 'have regard to the requirements of the Habitats Directive' in exercising their functions. It said that the LPA had first to assess whether the development proposal would breach Article 12(1) of the Habitats Directive. If Article 12(1) would be breached, the LPA then had to consider whether Natural England (NE) was likely to grant a EPS licence for the development; and in so doing the LPA would have to consider the three 'derogation tests'. The Court of Appeal went on to give clear guidance to LPAs as to how to decide planning permissions where the LPA concludes that a EPS licence (i) would be granted by NE; (ii) would not be granted by NE; and (iii) where the LPA is unsure.

The Supreme Court has thrown doubt on this guidance with the leading judgment of Lord Brown saying 'this goes too far and puts too great a responsibility on the Planning Committee whose only obligation is to have regard to the requirements of the Habitats Directive'. Although at first blush this may seem to throw the Court of Appeal's guidance entirely into doubt, upon close analysis of the facts my view is that the Supreme Court decision alters the position only to a limited extent.

The Supreme Court ruled, by four judges to one, that the LPA (Hampshire County Council) had adequately discharged its regulation 9(5) duty. In this case, NE had been consulted on the planning application, had considered it and ultimately had sent a letter withdrawing its EPS-based objection subject to implementation of recommended mitigation. It seems that NE's letter however did not make any specific reference to whether Article 12(1) would be breached. Nevertheless on the basis of NE's letter the Supreme Court ruled that the LPA was entitled to presume that Article 12(1) would not be breached and did not need to 'look behind' NE's view and assess the position for itself.

I think it is important to note that the facts of the case were such that the mitigation to be provided would have had the effect of avoiding the bats suffering 'deliberate disturbance'. Therefore, in this case, by withdrawing its objection in relation to the EPS on the basis of the mitigation to be provided, NE was indeed indirectly stating its view that Article 12(1) would not be triggered. However under a different scenario, such as where NE might withdraw its objection where a bat roost is being destroyed but is being compensated for by construction of a new roost nearby (legally this would be compensation, not mitigation), then it would not be correct to infer from the withdrawal of objection that NE believed there was 'no breach of Article 12(1)'. On the contrary, the destruction of a roost would amount to a breach of Article 12(1), notwithstanding that the provision of compensatory habitat might maintain favourable conservation status of the population and thereby meet one of the derogation tests.

So the Supreme Court's decision in Morge is authority for the point that where NE provides a consultation response which can, in all the circumstances, be regarded as confirming that no Article 12(1) breach will occur (either because the response says so clearly or because the facts of the case allow this to be inferred from NE's withdrawal of objection), then the LPA is entitled to rely on NE's view and need not analyse the facts in detail itself to establish whether Article 12(1) will be breached. The further strong implication from this is that if NE were to maintain an objection to any application on an

Article 12(1) basis then the LPA would most likely need to refuse planning permission.

However this decision does not rule upon the position where NE is not consulted on a planning application and indeed the Supreme Court says nothing in the judgment in recognition that for many planning applications NE does not comment. NE's standing advice confirms that NE expects to be consulted (absent applications affecting SSSIs, SPAs, SACs, Ramsar sites, National Parks, AONBs or requiring an Environmental Impact Assessment) only where the planning application has a significant impact on a protected species (EPS or otherwise). Due to the very general nature of the standing advice I am firm in my view that the standing advice could not be regarded as equivalent to a case-specific NE consultation response as was considered by the Supreme Court in Morge.

Where NE is not consulted then in order to discharge its regulation 9(5) duty my view is that the LPA would still need to consider itself whether Article 12(1) will be breached. Where it believes Article 12(1) will not be breached then the EPS should create no impediment to the grant of planning permission. However where a LPA believes Article 12(1) will be breached the LPA will still then need to consider whether NE is likely to grant a licence. This in turn will necessarily require consideration of the three derogation tests. Following analysis of the three derogation tests, the Supreme Court has made clear (see Lord Brown's judgment) that the LPA should only refuse planning permission if it believes that NE is unlikely to grant a licence. The implication of this is that where the LPA concludes that an EPS licence is likely to be granted by NE or even where the LPA is unsure of NE's likely response then (in contrast to the Court of Appeal's guidance) the EPS should not prevent the LPA from granting permission.

The case does however serve to highlight three issues:

- NE's consultation approach to EPS-related planning applications: Is it acceptable, where NE has 'primary responsibility for ensuring compliance with the Directive' (see Lord Brown's judgment), for NE to expect LPAs to have to consider EPS issues without NE's case-by-case consultation support? The standing advice (which deals with protected species including EPS) invites LPAs to consult with NE where there is a significant impact on a protected species and provides helpful examples of cases which NE would regard as significant. But that pre-supposes that the LPA has the expertise to judge where a significant impact on EPS is likely to occur. And in addition this leaves the LPA without NE's support to deal with many 'non-significant' EPS cases where Article 12(1) will still be breached. It is of course understandable that NE, in the face of cut backs, is seeking to prioritise its input. But should a distinction be made in NE's standing advice between protected species generally (where restricted consultation with NE is appropriate) and EPS (where restricted consultation may not be)?
- Judging the two 'planning' derogation tests (*i.e.* whether the planning application amounts to 'imperative reasons of overriding public interest', and whether there is any 'satisfactory alternative'): The LPA will always be in a better position than NE to judge these two tests and on that basis the system should, I believe, encourage the LPA to carry out an analysis of those two tests where a breach of Article 12(1) is to occur, even if NE also has to consider them at the EPS licence application stage.
- Planning conditions: Where measures are proposed by the developer so as to allow a conclusion of 'no breach of Article 12(1)' then in my view those mitigation measures ought to be imposed by the LPA by way of condition. However, where a breach of Article 12(1) is likely and the LPA must go on to consider whether the development is likely to be granted a licence by NE then any compensation proposed by the developer so as to meet the favourable conservation status test should not be conditioned, as that is a matter for NE licensing.

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An Alternative Method for Catching and Surveying Newts

David Dewsbury

Introduction

It is widely acknowledged that one of the best ways to survey reptiles and amphibians is by using refuges, either natural or man-made. Newts are no exception and they can often be found hiding under tiles and pieces of wood on the bottom of a pond. Traditional bottle traps have to be set at the surface where there are less newts passing by and they have a narrow opening. Consequently the probability of a newt entering is considerably reduced. Bottle traps are also at risk of being submerged which can be dangerous for newts and any other air-breathing creatures that become entrapped.

In order to be most effective a refuge must sit on the bottom and present a wider opening whilst at the same time retaining the animals for observation but allowing them to breathe at will.

The trap design shown in the diagram is the culmination of a trial carried out in spring 2010. The trial extended over a period of approximately two months and used four prototype traps enabling 43 ponds to be surveyed (some several times) with a total catch of 801 newts of all three species and with zero casualties. It gave a good overall picture of the newt distribution in the Forest of Dean and also some interesting observations of the newts and other animals captured.

A direct comparison of catch rate with traditional bottle traps was also carried out.

Summary of Benefits

The following potential benefits are apparent:

- Completely safe for newts.
- Newts can breathe air at all times and are not confined to shallow water or exposed to the sun.
- Much more effective at catching newts than bottle traps.
- Less need to use other survey methods, *e.g.* torching and egg searching.
- Much safer and more convenient for surveyors.
- Newts can be left for longer periods (current agreed maximum is 24 hours).
- No need to enter ponds or cause any significant disturbance.
- No night visits necessary.
- Possible to survey many more ponds so large-scale surveys possible.
- Offers greater scope for carrying out scientific studies on newt distribution, behaviour, disease, *etc.*
- May be able to correlate capture rate with newt density (more studies required).
- May offer a useful method for newt capture in mitigation situations.
- May be useful for capturing other air-breathing aquatic animals.

Design Description - Overview

My first prototype was hastily put together when moving house to remove the newts from my garden pond because the new owner of the property was going to fill it in. The device consisted of a biscuit box with

Figure 1. Great crested newt

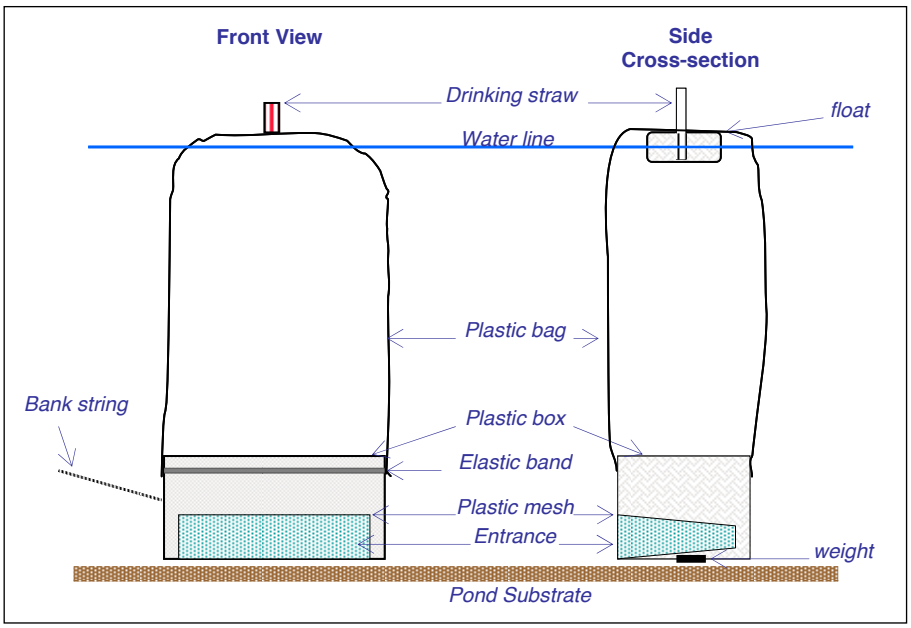

Figure 2. Newt trap diagram

a slot in one side, some netting to retain the newts and a plastic bag over the top to hold some air. This proved to be highly effective at removing the smooth newts until there were no more to be found. However, there would have been a number of difficulties using this prototype in the field. Once we were safely moved to the Forest of Dean I decided to try out some improved designs.

After carrying out a trial in 2010 using various designs with varying dimensions, I have settled on the design shown in the diagram. The design of the plastic box and plastic netting has remained more or less the same. The plastic bag now has a float and breathing tube to maintain a constant supply of air. A weight in the box causes it to sink to the bottom of the pond whilst the bulk of the air in the bag is expelled through the tube. Thus the device can sink fairly rapidly which makes it easier to deploy at the selected spot, especially if there is a wind blowing.

A particular box has been selected which is fairly straight sided and sufficiently large to accommodate quite a large catch of newts, especially when they are lifted from the water when conditions can become quite cramped for a short period. It is also just the right size to fit a suitable tall-bin liner which is quite strong and available from many supermarkets. The breathing tube is made from a drinking straw hence this and the fairly cheap bag can be simply replaced when deploying in a different pond. It is much easier than having to sterilise them.

The prototype devices used in the trial were made from components which I had available around our home were quite time consuming to construct. I have revised some of the components and methods to reduce this time considerably without (I hope) affecting the performance. There are further modifications which could be made to improve the design but these would require a wider usage of the device in order to be economic to manufacture.

Detailed Design Points

The entrance portal is a rectangular slot measuring 18 x 4 cm which I intend to use as a standard so that results from different traps can be compared with greater confidence. The entrance is situated right at the pond bottom so that newts traversing the pond floor will encounter it. The prototypes used in the trial had entrance slots of slightly different heights and widths for comparison but this did not appear to affect the capture rate very much.

Other designs included a much smaller square box and also a 'conventional' bottle trap design but sitting on the pond bottom with a plastic bag and breathing tube attachment. Both of these designs were disappointing in their newt capture rate and also rather cramped for the occupants.

The weight is made from a strip of lead which may not be ideal from an environmental point of view but I guess that its effect on the lead concentration of the water is negligible and it cannot be ingested by swans, *etc*. The weight must be securely attached to avoid it damaging the newts or their creeping underneath it.

A few holes in the base of the box facilitate the initial sinking until the water is able to enter via the main entrance slot.

The float and breathing tube construction detail is important for the welfare of the air-breathing inhabitants. The float is made from a length of water pipe insulation which is intended for 15 mm water pipe and is pre-cut along one side. The size of this must be large enough to render the whole device buoyant in the event that there is a sudden rise in the level of the pond. Thus it will float up from the pond bottom if necessary and any captive creatures will still be able to breathe.

The breathing tube is an approximately 7 cm length of drinking straw which has a small slot cut upwards from one end and this end is then inserted into the cut side of the float. The tube and float hold the bag at the surface of the pond with the tube protruding into the outside air. Thus there will always be a passage for air from the atmosphere above the pond to the inside of the bag above the water level. The size of the vent is only small but quite sufficient to maintain the level of oxygen in the air pocket inside the bag. The tube is held securely inside the float and to the top of the bag outside by a couple of specially acquired clips. (The small elastic bands used in the prototype were frustratingly difficult.)

It is important that the tube communicates directly between the outside air and the air inside the bag. Therefore the float must not be more than half submerged.

(This is one part of the design which could be developed so as to achieve a smaller protuberance above the water but the simple prototype seems to work well.)

The plastic bag is securely attached to the box using strong elastic.

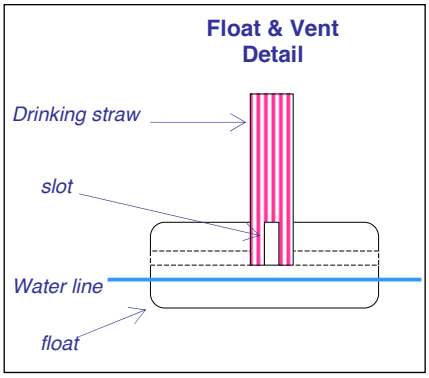

Figure 3. Float and vent detail

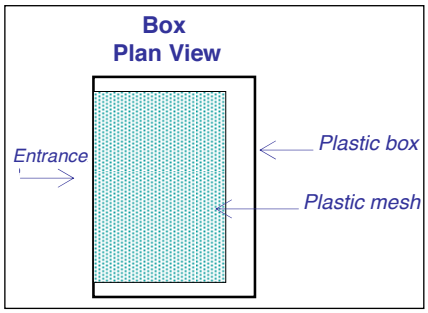

Figure 4. Box plan view

Operation

Assembly

It is preferable to assemble each trap at home before proceeding to the target pond. This takes about five minutes. The plastic box assembly, float, the float clips and plastic winder and string should all have been properly sterilised.

Figure 5. Small trap

1. Cut a length of drinking straw approximately 7 cm long, place one of the clips approx. 1.5 cm from one end and cut a slot in this end up to the clip. Place the clip end of the straw inside the float so that it protrudes at right angles from the centre of the float.
2. Select a new bag (unless the trap is to be used in the same pond as previously) and insert the float assembly so that the straw is positioned in the centre of the far end of the bag. Pierce the bag, push the straw right through and clamp the bag around the straw with the second clip.
3. Attach the elastic band around the box assembly approximately half way down. Place the open end of the bag over the box and secure it with the elastic ensuring that it is securely fastened all the way round and held firmly against the box rim. The plastic bag-tie around the neck of the bag (part of the bag assembly) serves to hold it firmly under the elastic. An excessive amount of the bag should not be allowed to obstruct the trap opening.
4. Loosely collapse the bag inside the box and place the winder and string on top.

Deployment

1. Select a suitable location in the pond to position the trap. Ideally this should be an area of clear water where the sinking will not be impeded by weed or debris and no more than a few metres from the bank. The depth of the water must not exceed the total length of the trap assembly (approx. 75 cm). Ideally a simple depth gauge will be used to measure this. (A length of string with a weight on the end and a fishing float secured 75 cm from the end would suffice.) The trap can be positioned near the bank if the pond is deep.
2. Unwind sufficient string to reach the desired spot and hold this loosely in one hand.
3. Drop the winder on the bank and secure it with one foot.
4. Toss the trap assembly out to the desired spot, trying to make it land upright. (Not essential.)
5. Allow the box to sink fully, wind in all slack line and secure the winder in the bankside vegetation. Submerge the line as much as possible to keep human attention to a minimum.

Retrieval

1. Pull the trap to the bank side fairly gently trying not to let the bag become snagged. If it is kept moving the box will glide across the surface quite well.
2. Grasp the float assembly through the bag (using litter picker tongs if necessary) and lift it whilst the box remains submerged. Wait until most of the water has flowed out of the box before pulling it from the water otherwise the bag may become detached and the captive newts will avoid being counted!
3. Identify, count and return the newts to the pond as soon as possible. The odour generated by a dozen or so great crested newts is quite noticeable so they must be under some slight stress. An assistant recorder (my wife, Susan) is a very useful asset especially if there are a large number of newts.

Figure 6. Double deployment

Sterilisation

There is potential for cross-contamination between ponds (*e.g.* of alien pond weeds and diseases such as chytrid) so thorough sterilisation is essential.

1. Thoroughly rinse the box assembly, the plastic netting and winder and string with a fine jet from a hosepipe to ensure that no particles of debris or plant material remain.
2. Immerse all components for 15 minutes in a 10% solution of bleach but discard the plastic bag and drinking straw.
3. Rinse with tap water and allow to dry.

Trial Results

A full report of my trial in the Forest of Dean is available on request.

The deployments commenced in early March but were relatively unsuccessful until the temperature reached approximately 10°C in mid-March. These early results have been ignored.

All traps were deployed, left overnight and retrieved the following morning. Although the newts would probably not come to harm if left for longer, the current agreement with Natural England is a maximum of 24 hours.

The prototype devices were very successful at catching newts and were a useful tool for surveying ponds for newts. They enabled a large number of ponds to be examined, mainly using only four 'standard' traps. A summary of the key results is as follows:

- All three species of newt can be found within the Forest of Dean.
- Species abundance: 65% palmate, 18% great crested, 17% smooth
- Total newts captured = 801
- Number of 'positive' deployments = 65 ('standard' devices where newts were present and temperature at least 10°C)
- Average total catch in 'positive' deployments = 12
- Maximum total catch in one deployment of all species = 48
- Maximum catch in one deployment of great crested newts = 19
- Number of newt casualties or deaths = 0
- Caught great crested newts in ponds with a low suitability index
- Total number of ponds surveyed = 43

Figure 7. Trap full of newts

Figure 8. Trap with sticklebacks

There was good agreement between this survey and a more traditional survey for Forestry Commission England conducted in 2008. Great crested newts were captured in all ponds where they had previously been suspected. In ponds where newts were thought unlikely to occur (*e.g.* because of fish presence), none was captured.

The traps also catch other creatures including toad and frog tadpoles, dragonfly larvae, sticklebacks, beetles, freshwater shrimp, caddis larvae and snails.

Although the duration of deployments was recorded, variations in duration were not very significant, probably because most individuals were captured during the hours of darkness.

Other interesting facts have emerged such as the sex ratio of captured newts which was found to be almost exactly 75% male and 25% female for all species. Some great crested newts were found to have deformed tails and others to have lost their tails by some kind of trauma.

The devices appear to open up possibilities for wider ranging studies of newt populations.

Problems Encountered

Some problems were encountered during the trap deployment:

- The traps were sometimes not sitting on the bottom of the pond, resulting in a zero or much-reduced catch. It is advisable to check the depth using a plumb line where there is any doubt. (The traps are designed to float in the event of a sudden increase in pond depth to protect captured newts from drowning.)
- In ponds with a very dense growth of vegetation, it was found that a space had to be cleared to allow the box to reach the pond bottom. If a layer of compressed vegetation unavoidably remains underneath the trap it may still be effective in catching newts. Care must be taken not move the trap so that the entrance becomes significantly obstructed by vegetation.
- A stiff breeze can cause the trap to drift a short distance before it sinks.
- Over-hanging trees can hamper the retrieval.
- Emptying a box of newts can result in considerable interest from passers-by but this is not usually much of a problem.

Comparison Trial

The comparison trials were conducted to make a direct comparison between the prototype devices and conventional bottle traps. The trial involved placing four conventional bottle traps at roughly 2 m intervals along the pond margin with 2 prototype devices deployed a few metres out from the same stretch of bank.

Comparison trials were conducted at two different ponds, each with a good population of great crested newts.

The results from three trials were as follows:

Pond 1
2 prototype traps, average 23 newts
4 conventional bottle traps, average 2.5 newts
Pond 2
2 prototype traps, average 20 newts
4 conventional bottle traps, average 2.5 newts
Pond 3
2 prototype traps, average 8 newts
4 conventional bottle traps, average 1.75 newts

The new prototype traps appear to catch many more newts than conventional bottle traps.

Additional Trials and Uses

Mitigation Projects

It would be interesting to see if these devices could be used to move large numbers of newts to an alternative pond. This may be a more effective and safer method than using landfall traps.

Other Aquatic Air-Breathing Animals

It may be possible to modify the trap dimensions to capture other creatures. For example, it would be interesting to see how effective it may be for capturing non-native aquatic frogs or their tadpoles, *e.g.* in comparison with funnel traps.

Availability

I have purchased components to construct sufficient traps for my own trials in 2011 plus some additional ones for anyone who would like to try them out under a Natural England licence. Please enquire via e-mail and I will be pleased to provide further information about the trial or availability of traps.

Acknowledgements

I would like to thank Kate Wollen and Forestry Commission England for their assistance and encouragement whilst carrying out my trial.

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Offsets for Species in the UK Planning Context: A Possible Methodology

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Introduction

Government policy as set out in Planning Policy Statement 9 (PPS9) is to ensure that planning decisions are consistent with prevention of harm to biodiversity. PPS9 states that planning permission should be refused unless significant harm to biodiversity can be prevented, adequately mitigated against, or compensated for. Furthermore, *Making Space for Nature: A review of England's Wildlife Sites and Ecological Networks* (Lawton *et al.* 2010) recommends the use of habitat offsets through the planning process. The Government is currently considering possible systems of conservation credits.

Treweek *et al.* (2010) proposed a method for quantifying habitat losses due to land use change/development and potential gains through offsets using Somerset Environmental Records Centre's Integrated Habitat System (IHS)[1]. Such a method was considered necessary to allow for quantitative assessment of what constitutes 'no net loss', whereas current ecological impact assessments (EcIA) are often based on subjective interpretations. However, the proposed system did not address the particular needs of species in cases where the amount, type and 'quality' of habitat might not be a valid surrogate for population viability.

This paper describes a method that could be used to calculate offset requirements for particular species, using an approach similar to the Habitat Evaluation Procedures (HEP) developed by the US Fish and Wildlife Service (1980) to provide '…for mitigation and compensation that can allow fair use of the land and maintain healthy habitats for affected species'[2]. HEP is structured around the calculation of Habitat Units (HU), which are the product of a Habitat Suitability Index (quality) and the total area of habitat (quantity) affected or required (US Fish and Wildlife Service 1980).

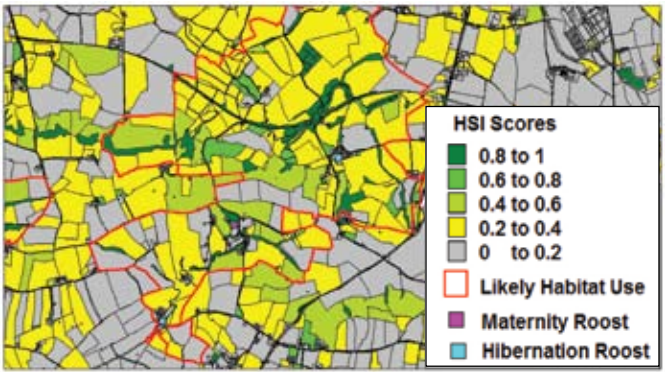

Figure 1. Illustrative example of a Habitat Suitability Index map for lesser horseshoe bats in the Mendip area, Somerset

A key assumption is that habitat type, amount and distribution influence the distribution of associated animal species. It is also important to recognise that HSI models predict habitat suitability, not actual occurrence or abundance of species populations (Dijak and Rittenhouse 2009).

The method presented in the paper is based on scoring of IHS habitat categories[3] in terms of their suitability for each species affected by a proposed development. The method is illustrated by reference to two examples where Habitat Suitability Indices for lesser horseshoe bat have been used to assess the implications of land use plans or proposed developments in Somerset. As it uses the same habitat classification system it can easily be linked with the habitat-based method proposed by Treweek *et al.* (2010).

Legislative and Policy Context for Offsetting Impacts on Species

In addition to suggesting that unavoidable impacts on biodiversity should be compensated for, PPS9 also requires planning decisions to take account of the particular needs of legally protected and UK Biodiversity Action Plan (BAP) priority species. Local authorities have a responsibility for the 'Favourable Conservation Status' (FCS) of European Protected Species (EPS) through Regulation 9 of the Conservation of Habitats and Species Regulations 2010. In their report to the determining committee, planning officers therefore need to include an assessment of the implications of a proposed development for achieving FCS of EPS (this may be done as part of the 'three tests' for EPS if an offence is likely to be committed).

Furthermore, species afforded protection by the Wildlife and Countryside Act 1981 (as amended) and those listed on Section 41 of the Natural Environmental and Rural Communities Act need to be considered at a population level if conservation objectives are to be met, *e.g.* under the UK BAP. The use of a habitat-only calculation for offset design would not necessarily guarantee that the ecological requirements to maintain a population of an EPS would be met, particularly if the offset habitat type differed from that lost or its location made it inaccessible to the affected populations of associated species. It is therefore important to check that the particular needs of EPS are met, that their FCS is not placed at risk and that any additional habitat replacement requirements to maintain a population of an EPS at FCS are identified.

Deriving Habitat Units for Lesser Horseshoe Bats

An offset for a particular species must be located on land which is theoretically suitable for that species. Habitat Suitability Indices (HSIs) can be derived by applying index scores between 0 and 1 to IHS main habitat codes, based on understanding of ecological requirements as derived from existing literature and professional judgement. The most

suitable habitat is allocated 1.0, *i.e.* optimal habitat for the species. Habitats not providing any support to the species at all would have a value of 0. The scores are then applied to the IHS dataset, (using a GIS such as MapInfo or ArcGIS), as additional attributes, to generate habitat suitability maps for each species of interest.

Where offset habitat has an HSI of 1.0, 1 ha will provide 1 unit of required habitat (1 HU), whereas 10 ha of a habitat valued at 0.1 would be required to make up 1 HU (Ritcey *et al.* 1998). If an IHS map is available for an area of search, this simple calculation can be automated in GIS, allowing a single click search of a polygon in terms of how many HUs (HSI x area) it would provide for each species assessed.

An example of an HSI Map is shown in Figure 1 for lesser horseshoe bats in part of the Mendip area of Somerset.

As well as the potential suitability of land for a species, it is also essential for an offset to be created where it will be accessible by the affected population. In Somerset, 'Species Occurrence Mapping' has been carried out using species records and habitat maps held by the Somerset Environmental Records Centre. This has made it possible to estimate current use of the landscape by species. In the case of lesser horseshoe bats, 'Likely Habitat Use' (LHU) depends on the suitability of habitat and its connectivity with respect to roost sites and likely foraging distances and roosts. The area of the LHU is extrapolated from species records through interpretation of aerial photographs, any field surveys and the results of radio-tracking (where available).

From overlaying the LHU on the HSI layer the value of the area in Habitat Units can be worked out for a population. Changes in land use can then be calculated in terms of Habitats Units (HU) to give a value of the extent to which offset land is likely to provide suitable and sufficient habitat to maintain a species population.

Habitats within the LHU are considered to be accessible to the species mapped. However, in the case of certain species, such as bats, habitats that occur within a certain distances of 'accessible habitat' are also identified as prey is also mobile and loss could affect availability to bats. These habitat polygons are selected through use of a buffer around the LHU and are termed in this study as 'Likely Supporting Habitat' (LSH).

Meeting the Needs of Multiple Species

Development often affects multiple species. For each species exposed to residual adverse impacts that cannot be mitigated for, at least the equivalent number of HUs would need to be created or restored to achieve 'no net loss' for that species. Figure 2 (quantities are in hectares) shows how offset habitat requirements could be determined for more than one species.

Figure 2. Determination of Offset Habitat Creation Where Multiple Species Are Affected

	Habitat Type 1	**Habitat Type 2**	**Habitat Type 3**
Species 1	1.5	1.2	0
Species 2	2	3	0.5
Species 3	4	1	1
Min. Amount of Offset Habitat Required	4	3	1

It is suggested that the maximum offset habitat requirement for each habitat type should be used to represent the required amount of HUs to prevent double counting. However, it is necessary to make these assessments with regard to the requirements of each species and the relative location of each population affected to ensure that offset habitat is accessible for all species exposed to losses due to development.

Implementing the Offset

Required Habitat Units need to be delivered through habitat creation or restoration effort, possibly in more than one location, depending on the type of habitat and use of the landscape by the species populations affected. To maximise opportunities for enhancement, offsets involving management intervention should ideally be located in habitat which is initially of low value to the species affected (*e.g.* a HSI score of 0.1 or 0.2): Lawton *et al.* (2010) state that 'receptor areas must not be places of high wildlife value.' Conversely the type of offset habitat created should be that most likely to benefit the species affected. Configuration of the created habitat for a particular species may also need to be considered in the design of the offset location.

It is also possible to use habitat suitability mapping approaches such as that described here to design or identify habitat networks, *e.g.* to enhance climate change resilience or to expand protected areas. As explained in the previous section, it is vital that any offset should be accessible to an affected population: it is no use creating habitat that is not linked with existing landscape-use by a species.

Implementation

HSIs have been applied in several land use planning exercises in Somerset, including Habitats Regulations Assessment of the effects of proposed development north of Taunton, Somerset on lesser horseshoe bats at Hestercombe House Special Area of Conservation (SAC) (Somerset County Council 2009). An example of the calculations required to determine requirements for offset habitat creation is given in Figure 3, showing the relative ease with which calculations can be made.

The formula applied to offset losses of existing habitat at the offset site is:

$$\frac{\text{Area Equivalent of Habitat Units Needed to Offset from Development}}{\text{(Habitat Value of Desired Habitat Type – Habitat Value of Offset Habitat Creation Site)}}$$

The table below, Figure 3, assumes that habitat creation on arable land would be used for the offset.

In this case, to ensure off site offset measures were robust and to allow for uncertainty, a habitat multiplier of two for one is applied to the resultant HUs lost to development. The Environment Bank recommend a two for one ratio where habitats are easily re-creatable

Figure 3. Offset calculation - Hestercombe House Special Area of Conservation

Field No.	**IHS Codes**	**HSI Score**	**Hec-tares**	**Landscape Use Modifier(s)**	**Habitat Units**	**Min. Hec-tares Total**
1	GI0. GM11. GL21	0.312	4.875	LHU 1	1.52	
2	WB3. WF21. WM1. WG4	0.63	1.302	LSH 0.5	0.41	
	WB3. WF21. WM1. WG4	0.63	0.7214	LSH 0.5	0.23	
3	GI0. GM11. GL21	0.312	0.8261	LHU 1	0.26	
	GI0. GM11. GL21	0.312	3.8893	LSH 0.5	0.61	
Total					3.03	
Adjustment for Equivalent Value of Offset Site					3.6	
Offset Ratio 2:1					7.2	7.2

contiguous to the development or on similar physical terrain as a minimum (Briggs *et al.* 2008). In many other situations a significantly higher multiplier may be appropriate (Moilanen *et al.* 2009).

Ideally, assessments of habitat suitability such as this would be carried out at an early stage in the planning process to guide proposed site allocations and to provide developers with an indication of likely offset requirements in terms of habitats and associated species, as well as the required lead-in time for offset habitat to mature sufficiently for it to benefit the species affected. From experience at Hestercombe House this approach seems to be welcomed by developers.

The Decentralisation and Localism Bill currently going through Parliament is expected to place greater emphasis on local decision-making, making it even more important for potential effects on species due to allocating or proposing development sites to be known at an early stage. This argues for an approach whereby local authorities assess proposed allocation sites in the initial stages of the development of land use plans. Ideally this would be done at a county level to ensure that a sufficient geographic area is taken into account, but this would require strengthening of County Councils' ecological capacity.

Conclusions and Recommendations

Criteria will need to be established to define the circumstances under which a 'bespoke' offset will be required to meet the particular needs of individual or multiple species. There may also be some species for which any impact will be 'non-offsetable' due to their rare or threatened status, or for which offsets requiring habitat creation will not be possible due to lack of reliable techniques.

The 'scoping study for the design and use of biodiversity offsets in an English context' (Defra 2009) recommended that offset habitat creation should not be permitted in cases where a parcel of habitat supporting a key population of an EPS, or representing critical feeding, breeding or commuting habitat of an EPS would be destroyed. Offset habitat creation should also not be permitted if losses of habitat due to an impact would cause irreversible population decline or make it impossible to achieve FCS. On the other hand, 'bespoke' offsets would be required where there are recent records of an EPS, UK protected or UK BAP species or where Habitat Suitability Mapping predicts the destruction of part of a habitat parcel used by an EPS, provided that offset habitat creation is feasible or is provided in advance (*e.g.* through a habitat bank). Offsets may also be needed where the development is likely to cause in combination or cumulative effects, again needing early assessment at the site allocation stage of development.

In all cases a comparison of the before and after development value to a species in terms of HUs should be made as part of the assessment, taking into account such factors as the effects of street lighting on replacement habitat. This would be needed to inform local authority decisions regarding the FCS element of the 'three tests'.

The proposed method has the following advantages:

1. It is straightforward to use and it requires relatively little investment to develop the necessary information base.
2. It links habitat-based methods with better understanding of the use of the landscape by protected species so that offsets can be provided in locations where they are accessible and will be used.
3. It provides an opportunity to design habitat networks and a possible framework for delivering offsets strategically within such networks to benefit species included in the UK BAP.

The majority of effort required to implement an offset system for species such as that proposed in this paper is the initial mapping of habitat use by species (Species Occurrence Mapping methodology). However, this can be limited to areas around centres where development is likely to occur. Once completed it is relatively easy to update by importing new records. The other time consuming activity is the creation of the HSI for each species, although once produced, this can easily be distributed nationally and amended to reflect local circumstances, further research and/or professional opinion. Once set up, the Habitat Evaluation method is easy to use and it is possible to 'black box' the whole calculation process.

Acknowledgements

Tony Price, ITC and Data Manager, Somerset Environmental Records Centre

Notes

[1] http://www.somerc.com/cdrom.php

[2] http://www.fort.usgs.gov/Products/Software/HEP/

[3] The IHS represents an integration of existing classifications in use in the UK with particular emphasis on Biodiversity Broad Habitat Types, Biodiversity Priority Habitat Types, Annex 1 of the Habitats Directive and Phase 1.

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Guidelines for Preliminary Ecological Appraisal

Ben Benatt CEnv MIEEM
Ecologist, Halcrow

Introduction

This draft document has been produced with the intention of providing best practice guidance for those undertaking preliminary ecological surveys and appraisals. It sets out minimum standards and identifies basic requirements for this early stage of the assessment. It also provides recommended terminology to aid consistency for the benefit of developers and planning authorities. An introduction to the draft document is provided below, but the full version is available for comment and may be viewed (by IEEM members) at www.ieem.net/gpea.asp.

The guidance document is available for consultation for a period of four weeks, after which the document will be submitted to the Statutory Nature Conservation Organisations for their review and hopefully, endorsement. Following these stages the final document will be published by IEEM as part of the Technical Guidance Series.

Background

Preliminary ecological surveys[1] have a range of purposes; one key use is in the site development process to gather data on existing conditions, often with the intention of conducting a preliminary assessment of likely impacts of development schemes or establishing the baseline for future monitoring. As a precursor to development projects, some evaluation is usually made of the ecological features present, as well as scoping for notable species or habitats, identification of potential constraints to proposed development schemes and recommendations for mitigation.

These ecological appraisals, together with any ecological evaluation undertaken, are separate from the more formal Ecological Impact Assessment (EcIA) (IEEM 2006) and may be prepared before undertaking a full EcIA or may be stand alone documents where no EcIA is required. No comprehensive up-to-date guidance exists for undertaking this type of baseline ecological appraisal.

Brief guidance is set out in Chapter 2 (*Extended Phase 1 Habitat Map with Target Notes*) of *Guidelines for Baseline Ecological Assessment* (Institute of Environmental Assessment 1995). This is the key reference, and appears to be widely cited by consultant ecologists as the basis for such studies. *Guidelines for Baseline Ecological Assessment* was published in 1995 and relevant information within it is concise and limited. Furthermore, since its publication, many changes have taken place with regard to planning and legislation requirements and standard ecological survey methodologies.

As a result of the lack of up-to-date guidance, there is a variety of ecological appraisal reports produced by consultants as part of the initial phase of the development process that use a range of differing names[1] and where the standard of survey and assessment may be variable. For example, the lack of a standard approach to these preliminary ecological appraisals may lead to uncertainty on the part of developers and regulators (planning authorities and government agencies) as to the level of ecological survey required in a particular situation and whether sufficient survey effort has been made.

Many terms are used to describe preliminary survey and reporting - Baseline surveys, Extended Phase 1 Habitat Survey; Constraints Survey; Ecological Site Assessment; Ecological Site Appraisal; Ecological Scoping Survey; Walkover Survey. Some of these terms are fairly old and are now rarely used although they are still encountered from time to time, *e.g.* walkover survey. Furthermore, constraints or scoping surveys (although they may vary in content) are unlikely to include any element of valuing of features, and walkover, scoping and constraints surveys are considered to be too limited or the terminology too loose. Consequently some standardisation is required to reflect the minimum works at this stage of the process, as set out below.

Applications

Situations where these appraisals would be undertaken include the following examples: where it is considered that an Ecological Impact Assessment (EcIA) is not required, to determine the baseline value and potential value of ecological features present and to establish any requirements for detailed/further surveys within proposed development sites and where ecological surveys are carried out to identify and value the features of interest as part of site management plans.

The results of baseline surveys are potentially of great importance as they often form the basis for further ecological surveys and EcIAs/EIAs and for the setting of site management objectives. Consequently, without a consistent approach, important ecological features may be 'scoped out' or inadequately surveyed at this stage and are then overlooked in subsequent ecological appraisals. The level of detail required for any ecological survey and assessment will depend on the nature of the development, statutory requirements and the needs of the developer and the regulator.

Contents of the Guidance

The guidance document provides further advice under the following headings:

- Methodology
- Scope
- Limitations
- Desk study
- Recording of results (habitat mapping, descriptive text, and target notes)
- Evaluation of ecological features and identification of potential impacts

- Recommendations for further surveys, general mitigation and possible enhancements
- Legislative (protected and notable habitats and species) and planning context

Methodology

The Methodology proposed includes the following key elements:

- Ecological surveys should to be undertaken by qualified professionals, experienced in ecological survey with an understanding of nature conservation legislation and planning and recognised by a relevant professional body such as IEEM.
- A desk study to identify notable (defined below) or protected habitats or species potentially impacted by the proposal under consideration.
- Survey based on Phase 1 Habitat survey (JNCC 2010), although other habitat mapping systems such as Integrated Habitat System (SERC 2007) may be used if considered more appropriate – coverage of certain habitat types such as include freshwater aquatic and marine habitats is relatively limited within the Phase 1 Habitats.
- Identification and mapping of marine and/or coastal habitats is a highly specialised task. A separate survey of these is recommended following *The Marine Habitat Classification for Britain and Ireland* (JNCC 2005). Where the ecologist(s) possess adequate expertise, a preliminary attempt may be made to identify accessible areas of littoral/intertidal zone using this classification system.
- An extension of this basic survey methodology to provide further details in relation to notable or protected habitats present within the survey area, or in relation to habitats present that have the potential to support notable or protected species.
- Some description of habitat condition, *e.g.* woodlands with a good layered structure or with standing dead timber; grasslands grazed, rank or 'tussocky'; ponds shaded or not; watercourses fast or slow flowing, poached banks; *etc.* These observations add value and indicate the type of management that may be needed in future.
- Clarity of the range of species and habitats under consideration. It may be considered relevant to include further habitats and species, besides those that are rare or legally protected, *e.g.* Biodiversity Action Plan habitats and species, and *Birds of Conservation Concern* (RSPB 2009).
- Target notes to provide supplementary information on features too small to map, or to provide supplementary details, for example relating to species composition, structure and management. Target notes may also be used to highlight important reference points and to help the reader navigate around the area.
- Quality control: there should be a clear audit trail detailing:
  - the surveyor(s);
  - the report author(s);
  - the quality controller(s); and
  - who signs it off.
- Clear definitions of the terminology used; for example:
  - 'Zone of influence', 'survey area' and 'desk study area' should all be defined in terms of the site and its surrounds.
- The criteria for valuing habitats and species should be defined (IEEM 2006).
- Relevant biodiversity data obtained as part of the site survey should ideally be submitted to Local Environmental Record Centres (subject to approval by landowners/clients where relevant).

Notes

[1] Also referred to as Baseline ecological surveys, Phase 1 or Extended Phase 1 Habitat Survey/Constraints Survey/ Ecological Site Assessment/Ecological Site Appraisal/ Ecological Scoping Survey/Ecological Site Walkover Survey

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SERC (2007) Integrated Habitat System. Somerset Environmental Records Centre, Wellington.

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Competencies for Species Survey

Simon Kain
Professional Affairs Intern, IEEM

The Professional Affairs Committee (PAC) is responsible for providing guidance on professional practice, to assist IEEM's objectives of advancing the science and practice of ecology, furthering biodiversity, conservation and sustainable development and upholding and advancing standards within the ecological profession. In 2007, PAC identified the need to establish clear criteria for, and guidance on, the level of knowledge, skills and experience required to competently undertake species survey.

With a view to developing this further, a meeting with the Statutory Nature Conservation Agencies (SNCOs) was held in 2008, concluding that there was no publicly available guidance on the knowledge, skills and experience that an individual should be expected to possess to survey for protected species.

Therefore it was decided to develop *Competencies for Species Survey* guidance as part of the Technical Issues Series, with a purpose to set out the criteria required to disturb, handle or carry out research works for protected species in a professional capacity. The guidance aims to:

- set a standard for the survey skills required by those practising ecology as a professional;
- assist in the provision of training by relevant bodies;
- assist the SNCOs in clarifying the skills and experience levels of applicants for species licences;
- provide background when dealing with enquiries for surveyors through the IEEM Commercial Directory; and
- provide information for potential clients that would help them understand the role and responsibilities of a surveyor and what can be expected of them.

Competencies guidance for white-clawed crayfish was the first to be drafted and has been used as a template for other species covered in the guidance. In October and November, the Secretariat held meetings with representatives from Amphibian and Reptile Conservation, the Bat Conservation Trust and the Mammal Society, to seek their input and support. As a result IEEM has worked very closely with these bodies and in association with them has drafted, or is in the process of drafting, guidance for the following species:

- Badger
- Barn owl
- Bats
- Brown hare and mountain hare
- Eurasian otter
- Great crested newt
- Hazel dormouse
- Hedgehog
- Natterjack toad
- Pine marten
- Polecat
- Red squirrel
- Reptiles
- Shrews
- Water vole
- White-clawed crayfish

The finished guidance will be published in the coming months, and the species covered will be expanded to cover other fauna such as marine species, and flora. It will be a live document, with changes and additions made where required. While it currently only covers surveying, in the future it will be expanded to cover the knowledge, skills and experience required to carry out mitigation and development works.

The *Competencies for Species Survey* will be available to the public and is intended to assist ecologists undertaking protected species surveys or conducting ecological research, developers commissioning surveys from professional ecologists, planners and ecologists working within local authorities or SNCOs, and training providers.

Attainment of the criteria outlined in this guidance does not guarantee that individuals will be granted protected species licences, as this is the role of the SNCOs, but the guidance will enable individuals to demonstrate their knowledge, skills and experience. It will also enable people looking to get a licence to identify areas where they require further training. This publication is an example of IEEM raising standards in the ecological profession for the benefit not only of ecologists but also for the public.

IEEM would like to thank Paul Bradley, Johnny Birks, Paul Chanin, Tom Clarkson, David Clements, Melanie Findlay, Tony Gent, Mick Green, Peter Hancocks, Dorian Latham, Stephanie Peay, Liam Russell, Richard Sands, Colin Shawyer, David Wells, Phil Wheeler, Kate Williamson, Dorothy Wright, Derek Yalden, Amphibian and Reptile Conservation, the Bat Conservation Trust, the Mammal Society and the Professional Affairs Committee, for their help in developing the guidance to date.

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Pine marten
Photo: www.wildstock.co.uk

Collaborative Awards in Science and Engineering (CASE) Studentships

Linda Yost CEnv MIEEM
Deputy Chief Executive Officer, IEEM

The CASE Open Competition is an award that promotes partnerships between eligible research organisations and public or private organisations. Around 35 studentships will be awarded in 2011. Up to five studentships are awarded in each of the six priority areas listed below, to facilitate collaboration with private sector partners. An application with a public sector CASE partner is only considered in the general competition.

1. Water
2. Energy
3. Food and agriculture
4. Resource management (minerals, forestry, waste, *etc.*)
5. Financial services (risk management and valuation, including insurance)
6. Environmental monitoring

A CASE studentship is a PhD studentship during which the student enhances their training by spending between three and 18 months with the CASE partner in a workplace outside the academic environment. CASE studentship projects must provide a sound training in the methods of research and a stimulating intellectual challenge for the student. The impetus and initial requirement for the research should originate from the CASE partner and both the research organisation and the CASE partner nominate supervisors responsible for overseeing students' training.

One of the scheme's main criteria is 'impact'. Applications must be able to demonstrate the potential for societal or economic impact through collaboration with the CASE partner, as well as the provision of high quality training in research skills. Applications focusing solely on the advancement of science and on academic impact are provided for by the algorithm studentships route.

The applications are assessed by a panel (whose members are sourced from a wide range of organisations including: statutory bodies, industry, professional and research institutes, societies and academia) of which at least five are IEEM members. Each proposal is assigned to two members of the panel for scoring and to act as introducers at the panel meeting. The panel's role is to evaluate the collaborative societal value and economic value on the CASE partner (public/private organisations); the relevance of the topic and whether it is likely to produce high quality science and whether it will provide a stimulating and tractable topic for the student; whether the student will receive adequate generic and specialist training and whether the supervisors are sufficiently expert and active in the stated research field. Competition is stiff with well over 130 applications for the 35 awards.

Applicants for CASE studentships may not be aware that the topic range is so great that it is not possible to have a panel with specialists for each and every topic, though where necessary external evaluators are sought. Assessors have to rank their knowledge/expertise against each application as having a 'high level of expertise', 'sufficiently knowledgeable to provide an informed opinion', or 'able to provide a generalist opinion only'.

My first impressions as a new assessor are varied. The forms themselves could benefit from a redesign; the layout does not assist the assessor to glean the essential information without thorough scrutiny. The applications appear mainly to be written by the academic partner so it is not always obvious who the CASE partner is, when, why and how they would be involved and support the student. Often it was not clear what was in it for the student, with very limited reference to training and not always demonstrating the breadth of skills the student would gain. Information on the supervisors in some cases suggested the student would be the proverbial 'indian with lots of chiefs', potentially not a good scenario. In one application the supervisor provided no background information, merely a long list of (meaningless) publication titles. Knowledge transfer, that is the societal and economic impact, was often very limited; and disappointing that publication of information in IEEM's *In Practice* was not seen as a route to broadcast research in applied ecology to practitioners! On the whole though, the applications were of a good standard.

It is an interesting exercise providing assessors with a snapshot of the very wide range of potential research, with some of the topics very relevant to ecologists and environmental managers.

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Institute News

A New Year

The year has got off to a very busy start for the Secretariat team and IEEM's Committees. The finishing touches are being put to the Institute's new Strategic Plan and Annual Business Plan and, once ratified by Council, it will be full steam ahead to start delivering some of the key tasks, not least being preparatory work and a membership drive to build momentum towards gaining our Royal Charter.

Speaking Out

One of the Institute's most important roles is speaking out on behalf of the profession. Whilst there have been signs of a slight upturn in work for members in the private sector, those working in other employment areas are feeling the pressure. Some informal research amongst members working for local government revealed some horrendous stories of savage cuts to ecological/countryside/environmental posts. This of course comes at a time when the Coalition Government's drive to a localism agenda will place more pressure on local authorities to deliver sustainable development that protects and enhances biodiversity and ecosystem services. Surely this is a time when access to sound advice and guidance from our profession is even more critical!

These were some of the points made by IEEM's President, Professor Penny Anderson, when she wrote to the Secretary of State for Communities and Local Government and related Ministers in the devolved administrations. The President also wrote to the local government association in each UK country to make them aware of the implications of the job losses, especially in relation to the legal responsibilities local authorities have to comply with EU nature conservation legislation. The responses to these letters have provided us with further opportunities to press home understanding about the role of the professional ecologist and environmental manager in a local government context.

In a similar vein members of the Irish Section, together with IEEM's President, wrote to the Irish Government about the impact of the severe budget cuts on environmental protection in Ireland. The financial crisis in Ireland has been well publicised and the December budget announced cuts of 56% to the National Parks and Wildlife Service and 47% to the Heritage Council.

Managing Biodiversity Data

Members will have noted the recent articles in *In Practice* about the sharing of ecological survey data and biodiversity data management is clearly a hot topic at the moment. IEEM has had discussions with representatives from the National Biodiversity Network and hopes to talk to the Association of Local Environment Records Centres (ALERC) shortly. At a recent presentation to staff of local records centres and environmental consultants in East Anglia, IEEM's Chief Executive, Sally Hayns, made it clear that IEEM is supportive of action to improve the sharing and accessibility of data and is willing to play an active part in measures to find a way forward.

Consultations and Meetings

With the support of member contributions the Institute has recently been involved in a number of consultations including responding to the Defra consultation on Biodiversity Offsetting. IEEM submitted its response in partnership with the Association of Local Government Ecologists (ALGE) and this can be seen on the IEEM website. Several representatives from IEEM also recently attended the series of Natural Capital Initiative workshops organised by the British Ecological Society and a Parliamentary Office for Science and Technology (POST) meeting on Biodiversity Offsetting.

In January, a meeting was arranged with Convenors and other Geographic Section Committee members to consider the emerging Strategic Plan and the role Geographic Sections play in helping to deliver some of its targets. This was a very stimulating and enjoyable event which enabled sharing of experiences and ideas between Geographic Sections as well as discussion of ways in which the Secretariat could improve support to the Section Committees.

IEEM Conferences 2011

Spring Conference, 23 March 2011, London
Invasive Species: New Natives in a Changing Climate?

Summer Conference, 15 June 2011, London
Biodiversity and the Big Society

Annual Conference, 2-3 November 2011, Liverpool
Rebuilding Biodiversity

More information: www.ieem.net/conferences.asp

2011 Professional Development Programme

Don't forget that the 2011 programme of workshops and training courses is now available. If you have mislaid your copy (included in the December issue of *In Practice*) then all of the courses can be viewed online. We will also be adding courses throughout the year.

External Training Supplement

Along with the June 2011 edition of *In Practice*, we will be publishing an external training supplement to be mailed out to all members. If you are interested in advertising in the supplement please see www.ieem.net/advertising.asp.

Tony Bradshaw Best Practice Awards 2011

The awards are now open for 2011 entries, for more information please see www.ieem.net/awards.asp.

Ecological Skills Project Update

Work is continuing on this important project to define the knowledge, skills and competence for our profession. Following analysis of survey data and interviews with key stakeholders undertaken by the project consultants, The Management Standards Consultancy, over 40 interested representatives from across our professional sectors attended a Technical Workshop held in Birmingham last month. At the workshop the results of the research were discussed together with its implications for further defining, developing and promoting our profession. The outcomes of the workshop will be included in the final report (due in June) and include a challenging but exciting agenda of action for the Institute.

Staff Changes and News

Laura Wilson, an intern who completed the work on updating and expanding our resources for students as well a providing support to the Geographic Sections, left us in December after six months. We are very grateful for all of her hard work on behalf of members.

The Institute has also very recently said goodbye to another intern, **Simon Kain**, who left us recently after several months working on professional affairs projects including updating the *Sources of Survey Methods* and some of the Institute's Professional Guidance Series. Simon did some excellent work and we wish him well for the future.

IEEM will be losing its long-serving Membership Officer very shortly when **Anna Thompson** retires after more than 12 years with the Institute. Anna initially started as a volunteer but joined as a member of staff when the rise in membership applications meant that some additional help was required. Anna's patience, helpfulness and dedication to administering smooth membership services is well known and, we are sure, very much appreciated by all our members. We certainly wish her a very long and happy retirement.

West Midlands Section News

Exploring Issues of Common Interest

On 16 November 2010 we held a very lively joint event with West Midlands Local Government ecologists and environmental managers. This was an informal meeting to identify and explore issues of common interest, such as:

- What would really help local authority planners and consultants operate the planning system more effectively?
- Working across administrative boundaries
- The gulf between academic research, planning policy formation and individual planning applications on landscape scale approaches
- Use of LBAP priorities
- Development control
- Building in ecosystem services
- Householders and bat surveys

Inevitably, a huge range of issues were highlighted and we are looking to set up three or four task and finish groups to take some of these forward.

Upcoming Events for 2011

The West Midlands Section Committee is planning a number of interesting events for 2011. Please do keep an eye out for further details of the events on the IEEM website and in e-mails that will be sent out to members with an invitation to participate.

The events are likely to include a spring reptile site visit or workshop looking at reptile survey and mitigation and a summer site visit looking at the butterflies of Ryton Woods in Warwickshire. In the autumn we will be hosting our second AGM which will include keynote speakers. There will be an otter event at Bodenham (shown in the photo below) in Herefordshire in October where there may also be a chance to look at woodpecker management and cider-making! We are hoping to organise a mini-conference later in the year looking at a coordinated approach to mitigation for development affecting the Cannock Chase SAC.

Veronica Lawrie CEnv MIEEM
Committee Member, West Midlands Geographic Section

Welsh Section News

Careers Event for Welsh Students

An evening panel discussion, *The Great Jobs Debate – Are There Careers in the Environment Sector?*, was organised by the IEEM Welsh Shadow Section in partnership with Natur and Cardiff University and held on 2 December 2010 at the university in the Welsh capital, following a successful similar event in Bangor earlier in the year.

The event was chaired by Professor Steve Ormerod, of Cardiff University and Past-President of IEEM, with guest speakers representing various professionals working in ecology and environmental management.

Students from institutions across south Wales were invited to ask questions about careers in the sector, to a panel which included Mike Alexander of the Countryside Council for Wales, Dr Hefin Jones of Cardiff University, Andy Briscombe of Newport City Council and Richard Dodd of Wildwood Ecology Consultancy. Gemma Bode of the Gwent Wildlife Trust was unable to attend due to illness.

Around 40 students from Cardiff and Swansea universities attended, with an interesting discussion covering topics such as how valuable volunteering is in getting established in a career in ecology? How does the experience and skills gained through a PhD compare to volunteering and early employment over a similar period? What sort of work is available in other countries and how does this link into a long-term career back home? What changes in legislation may affect environmental careers in the future and what are 'hot topics' in which experience may be required?

The panellists gave varied and insightful answers based on their own experiences and the evening ended with a summary from Steve outlining key 'tips' for getting a job, these included taking advantage of any opportunities to gain relevant experience and being persistent and positive in pursuing what you are really interested in.

Feedback from the students after the event was positive and there is good potential for holding a similar event again in the near future.

Abbey Sanders CEnv MIEEM
Committee Member, Welsh Geographic Section

Partnership News

Society for the Environment

We are very pleased to annouce that the following IEEM members have been approved as Chartered Environmentalists since the last list was advertised in March 2010:

Mr Daniel Ahern, Mr William Akast, Mr Simon Allen, Dr Julia Baker, Mr Jonathan Barnes, Mr Steven Bater, Mr Greg Chamberlain, Mr Mark Champion, Dr James Cook, Dr Philip Corney, Mr Neil Davidson, Miss Rebecca East, Dr Judy England, Miss Marie Evans, Miss Katharine Fisher, Miss Siri Frost, Mr James Garry, Mr Philip Griffiths, Mr Benjamin Goodger, Mr Matthew Hague, Miss Drusilla Hall, Dr Mark Hampton, Mr Steven Jackson, Miss Rachel Kerr, Mr Andrew Law, Mr Simon Mason, Mr Thomas McArthur, Dr Caroline McParland, Miss Leila Payne, Mrs Iona Pearson, Mr Lee Penrose, Mr Andrew Perry, Mrs Joanne Pickard, Miss Kate Priestman, Mr Craig Sandham, Mr Mark Satinet, Mr Duncan Smith, Mr Thomas Smith, Dr Jason Weeks, Mr Julian Whitehurst, Miss Joanne Wilson

The ENDS Report has teamed up with the Society for their 2011 survey of environmental professionals. They would like to encourage all the environmental professionals across the wide array of sectors represented by the Society's membership, to provide input and receive a summary of the results, plus the chance to win a bottle of organic sparkling wine. To take the survey please visit: www.zoomerang.com/Survey/WEB22BD9EAF9DH

www.socenv.org.uk

Countryside Management Association

The Countryside Management Association (CMA) has recently been considering its future as a network of environmental management professionals. As a consequence, the CMA and IEEM have recently been discussing what opportunities there may be for their members who are interested and eligible to join IEEM to do so and thus enjoy the wider benefits of IEEM membership. The CMA are currently consulting their members on the various options but IEEM would certainly welcome the addition of more environmental management professionals to our fold together with the skills and experience that they would bring.

www.countrysidemanagement.org.uk

European Network of Environmental Professionals

At the start of 2011 the European Network bustles with activity. And fortunately this is not just in Brussels: the new Working Groups that are being instituted start to deliver their work plans. Existing groups, including the Biodiversity Working Group chaired by Mile Barker CEnv MIEEM, continue to push ahead.

The ENEP *Newsflash* is also up and running again, and with good substance including a five-page comprehensive overview of the latest EU regulatory and policy-making news, organised by theme and available on the website. Of course, ENEP also wants to make its own imprint on these policies and by the time you read this will have met with Catherine Bearder MEP. This year ENEP will further intensify its contacts with the Commission and Parliament.

The network also continues to extend the voice of environmental professionals across Europe with new members potentially joining from Belgium, Croatia and France.

Lastly, ENEP will shortly send out a simple survey to determine preferences among the over 45,000 members regarding ENEP's activities. Please do take the time to complete it.

www.efaep.org | www.environmentalprofessionals.eu

Europarc Federation

The Alfred Toepfer Natural Heritage Scholarships 2011 are now open for applications. The award provides three young European conservationists with €3,000 to undertake a study visit to one or more protected areas in European countries other than their own. It is given by the Alfred Toepfer Foundation and the Europarc Federation. The deadline for applications is Friday May 20 2011. More information about the Alfred Toepfer Scholarships and the application form can be found at www.europarc.org/what-we-do/alfred-toepfer-schol.

www.europarc.org

International Year of Biodiversity

With the 2010 International Year of Biodiversity (IYB) having closed we can look back on a fantastic year of effort from all the partners around the world and especially those in IYB-UK.

IYB-UK is now preparing an evaluation report. What is clear is that the task of achieving a much higher level of biodiversity awareness across society is only just beginning, which is one reason why, in response to the Aichi targets agreed at the COP10, the UN has confirmed their plan to designate 2010–2020 as the International Decade of Biodiversity.

This year, 2011, is the International Year of Forests, so hopefully the timing is right to help build the bridge between biodiversity and climate responses, and coming up in 2012 are other opportunities to mobilise understanding: Rio Earth Summit +20 (will aim to focus on joining up our understanding of a green economy that brings together climate change, sustainable development and biodiversity); and the Convention on Biological Diversity COP11 in India (when key actions following Nagoya COP10 agreements have to be in place to fulfil the 2020 targets).

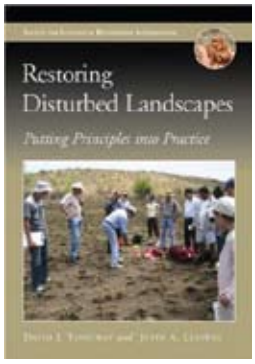
www.biodiversityislife.net | www.cbd.int/2010/welcome

Countdown 2010

The experience of Countdown 2010 has shown that there is a need for such initiatives. Although the initiative comes to an end in 2010, the biodiversity clock does not stop. Building on the success of the initiative, IUCN, the International Union for Conservation of Nature – which hosts the Countdown 2010 Secretariat – will launch a new initiative for 2011 and beyond.The new Countdown initiative will bring together thousands of partners from all parts of society, and from all over the world. In other words…a bigger and stronger biodiversity movement!

www.countdown2010.net

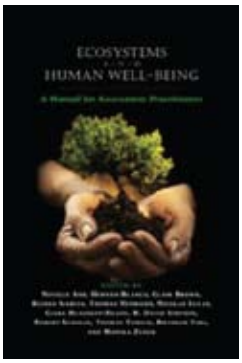
Recent Publications



Restoring Disturbed Landscapes: Putting Principles into Practice

Editors: David J Tongway and John A Ludwig
ISNB-13: 9781597265812
Price: £18.99
Available from: www.nhbs.com

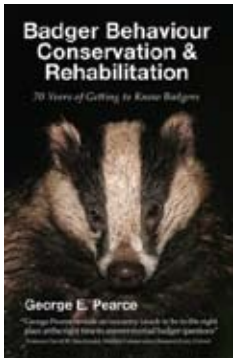
This publication is a hands-on guide for individuals and groups seeking to improve the functional capacity of landscapes. Abundantly illustrated with photos and figures, it is an engaging and accessible work designed specifically for restoration practitioners with limited training or experience in the field. It uses a five-step adaptive procedure to tell restorationists where to start, what information they need to acquire, and how to apply this information to their specific situations. It is part of a series by the Society for Ecological Restoration International offering a foundation of practical knowledge and scientific insight that will help ecological restoration become the powerful reparative and healing tool that the world needs.



Ecosystems and Human Well-Being: A Manual for Assessment Practitioners

Editors: Neville Ash *et al.*
ISNB-13: 978-1597267113
Price: £20.00
Available from: Island Press

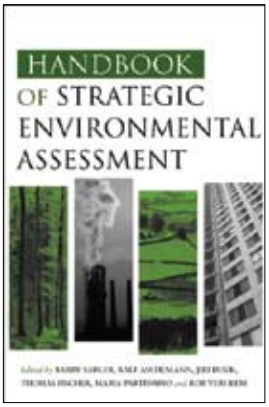
The Millennium Ecosystem Assessment (MA) is the most extensive study of the linkages between the world's ecosystems and human well-being. It is one of the most important conservation initiatives ever undertaken, and the ecosystem services paradigm on which it is based provides the standard for practice. This manual supplies the specific tools that practitioners of the paradigm need in order to extend their work into the future. The manual is a stand-alone guide to conducting assessments of the impacts on humans of ecosystem changes. It builds on the experiences and lessons learned from the MA global and sub-global assessment initiatives, with chapters written by well-known participants in those initiatives. It also includes insights gained from service-focused assessment activities since the completion of the MA in 2005.



Badger Behaviour Conservation and Rehabilitation: 70 Years of Getting to Know Badgers

Author: George E Pearce
ISNB-13: 9781907807039
Price: £24.99
Available from: www.nhbs.com

A fascinating insight into badger biology, life in the sett, rescue and rehabilitation, consultancy, badgers and farming, and badger-watching. George E Pearce has surveyed over 700 sites, visited over 1,500 setts, been consulted as an expert in 120 animal cruelty cases and rehabilitated over 100 badgers. Brought up on a farm, he earned his living as a farmer for 45 years. Today, George is a badger consultant; and the foremost expert on the British mammal he admires the most. For many years, the RSPCA, police, veterinary surgeons and conservation groups all over the country have relied on George's knowledge and his instinctive feel for animal behaviour. Share his experience and enthusiasm for badgers from his 70 years of badger watching and his vast professional wildlife experience.



Handbook of Strategic Environmental Assessment

Editors:
Barry Sadler *et al.*
ISNB-13:
9781844073658
Price: £75.00
Available from:
www.earthscan.co.uk

This authoritative handbook surveys the full breadth and depth of SEA, bringing together a range of international perspectives and insights on the theoretical, methodological and institutional dimensions and practical issues of the field. It then subjects this conventional wisdom to a critical reappraisal, looks at the vast lessons of experience and offers new ideas and interpretations as to where the field is going. The volume is organized into six major sections, beginning with an introduction and overview of the development of the field and a framework for evaluating SEA good practice. Part I comprises a review of SEA frameworks in leading countries, the European Union and developing regions. Part II reviews SEA practice in several major sectors (energy, minerals, transport, water, development assistance and coastal zone management). Part III addresses the linkages between SEA and other comparable tools such as spatial planning and environmental management. Part IV probes key cross-cutting issues in SEA, including how to address cumulative and trans-boundary effects. Part V identifies ways and means of SEA process and capacity development, focusing on how to improve and upgrade the theory and practice of the field. Part VI examines the shift from conventional SEA towards more integrative approaches, drawing on experience and examples from a number of countries.

A Guide to Management Planning

Author: Mike Alexander
ISNB-13: 0-9549862-2-9
Price: Free download
Available from:
www.esdm.co.uk/cms

The Conservation Management System Consortium (CMSC) have released an updated version of the free CMS Management Planning Guide featuring some stunning photography as well as advice on how to write a management plan.

In the Journals

Jason Reeves AIEEM

D Goulson *et al.*
Effects of land use at a landscape scale on bumblebee nest density and survival
Journal of Applied Ecology 2010, 47: 1207–1215

We have little idea how landscape-scale factors influence the success of wild bumblebee nests over time. In this study the authors used molecular markers to estimate within-season changes in the numbers of nests. Workers of two bumblebee species were sampled in an arable landscape in late May–June and late July–August, and the numbers of nests represented in each sample were estimated. The authors compared the methods available to estimate nest number from such samples and concluded that methods which allow for heterogeneity in the probability of capture of nests provided the best fit to their data. Changes in numbers of nests at the two time points were used to infer nest survival. The two bee species appeared to differ markedly in survival over time, with estimates of 45% of nests surviving for *Bombus lapidarius* and 91% for *B. pascuorum*. However, the data suggested that the foraging range of *B. pascuorum* may be greater in late season, which would lead to an overestimated nest survival in this species. Differential survival may also reflect differences in phenology between the two species. The land use class which had the most consistent effects on nest number and survival was gardens; for *B. lapidarius*, the area of gardens within a 750 and 1,000 m radius positively influenced nest survival, while for *B. pascuorum*, the number of nests in late samples was higher at sites with more gardens within a 500 and 750 m radius. For *B. pascuorum*, the area of grassland within a 250 and 500 m radius also positively influenced nest number in late samples, probably because this is the preferred nesting habitat for this species. The importance of gardens is in accordance with previous studies which suggests that they now provide a stronghold for bumblebees in an otherwise impoverished agricultural environment; furthermore, the authors' data suggest that the positive influence of gardens on bumblebee populations can spill over at least 1 km into surrounding farmland. The substantial effects that even small areas of local resources such as rough grassland or clover leys can have on bumblebee nest numbers and survival is of clear relevance for the design of pollinator management strategies.

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E Grotkopp, J Erskine-Ogden and M Rejmánek
Assessing potential invasiveness of woody horticultural plant species using seedling growth rate traits
Journal of Applied Ecology 2010, 47: 1320–1328

The ornamental plant trade, forestry, and agriculture have been responsible for the initial introduction of over 60% of invasive alien plant species. Screening tools to test potentially new horticultural species should help curtail the continued introduction of new invaders. Using two methods for analysing phylogenetically independent contrasts (PICs) of known invasive and non-invasive, exotic woody horticultural species, the authors tested the potential of relative growth rate (RGR) and related traits including net assimilation rate (NAR), leaf area ratio (LAR), and specific leaf area (SLA) as predictors of invasiveness. These 29 PICs include 65 species and broadly cover angiosperms. Without accounting for phylogeny, no significant differences were found in seedling RGR or related traits between invasive and non-invasive woody species. Using PICs, invasive species' RGRs were significantly higher. RGR was considerably more significant using the authors' extensive dataset than in previous smaller studies, while SLA and LAR remained marginally significant. NAR was significantly higher for invasives for the 10–20 days interval. Analysis of this broad data set confirms that RGR is significantly higher for invasive woody species than their non-invasive counterparts, and may serve as a useful biological predictor of invasiveness for woody angiosperms. This expanded study shows that plant species use different physiological and biomass allocation patterns to achieve higher RGR; therefore individual components of RGR, such as SLA, do not consistently predict potential invasiveness of species. Seedling RGR could potentially produce a useful, straightforward screening tool when phylogenetically related species or cultivars are available.

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MU Grüebler, F Korner-Nievergelt and J Von Hirschheydt
The reproductive benefits of livestock farming in barn swallows *Hirundo rustica*: quality of nest site or foraging habitat?
Journal of Applied Ecology 2010, 47: 1340–1347

In many parts of the world, changes in agricultural land-use have led to significant declines of bird species, including aerial insectivores such as barn swallows. In particular, barn swallow populations have been declining across Europe where mixed and livestock farming have been replaced by arable farming. A positive association between livestock farming and barn swallow reproductive success is well documented but the specific roles of micro- and macro-environment, which are not mutually exclusive, remain unclear. A positive effect of livestock on swallow breeding performance might be due to improved feeding conditions associated with dung around cattle farms (macro-habitat). Barn swallows also might profit from raised and more constant temperatures at the nest site in stables housing farm animals (micro-habitat). The authors analysed data on barn swallows breeding across Switzerland to quantify the effects of livestock farming at the micro- and macro-habitat on the reproductive success of single- and double-brood pairs. They focused on the effects of nest temperature (expressed as presence of livestock) and food availability around the nest (quantified by the number of manure heaps providing large number of flies). The presence of livestock in the building with the nest and large numbers of manure heaps around nest sites increased nestling survival in double-brood but not in single-brood pairs. Furthermore, the presence of livestock tended to increase the probability of pairs rearing double broods and increased the annual output of double-brood pairs by 0.8 chicks. Both factors of livestock farming combined increased the annual output by 1.6 chicks. The productivity of barn swallows depends on the characteristics of the micro- and the macro-habitat. Since changes in farming systems, grazing patterns, landscape heterogeneity and climate may have different effects on micro- and macro-habitats, respectively, they affect productivity of declining bird species in a complex way. Measures designed to enhance habitat quality in aerial insectivores should improve microclimatic conditions at the nest and increase the number of food patches providing airborne insects. In general, habitat improvements should include both spatial scales, namely suitable sites for nesting and accessible food resources on the foraging grounds.

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A Doxa *et al.*
Low-intensity agriculture increases farmland bird abundances in France
Journal of Applied Ecology 2010, 47: 1348–1356

Farmland biodiversity continues to decline mainly because of agricultural intensification and land abandonment. Agri-environment schemes can be designed to halt this loss by favouring extensification of agricultural practices and through sympathetic management of field boundaries and fallow land. In Europe, High Nature Value (HNV) farmland is defined as low-intensity farmland

supporting or associated with a high rate of biodiversity, in terms of species richness or habitat diversity and therefore plays a crucial role in the maintenance of European biodiversity. However, no large-scale analysis has explored the role of these areas in achieving conservation goals. The authors analysed information from widely used indicators in order to describe the impact of low-intensity agriculture on farmland biodiversity in France. They used the HNV farmland indicator, based on agricultural statistics such as the Farm Structure Survey and the grassland survey, and common bird indicators, *i.e.* the Farmland Bird Indicator (FBI), the Community Specialization Index (CSI) and species richness indexes, based on the French Breeding Bird Survey. Temporal trends in the farmland bird indicator showed that populations of farmland birds were more likely to increase inside HNV areas compared to non-HNV areas. Although species richness is not higher within HNV farmland, bird communities are composed by more specialist species than in non-HNV areas. In addition, these specialist bird species are significantly more abundant in HNV areas. Further farmland biodiversity decline is potentially reversible through an appropriate management of HNV areas. The authors suggest that existing and future agri-environment schemes should focus on preserving and extending HNV farmland, by favouring the maintenance of low-intensity agriculture and landscape complexity. Priority should be given to preserving diversity at the community level, with the help of adequate indicators, such as the ones presented in this paper. The role of HNV farmland or similar concepts in combining agriculture and biodiversity goals should be further analysed and further used as large-scale conservation tools.

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EM Rantanen *et al.*

Habitat preferences and survival in wildlife reintroductions: an ecological trap in reintroduced grey partridges

Journal of Applied Ecology 2010, 47: 1357–1364

Wildlife reintroductions can help to restore populations and save species from extinction. However, success rates of reintroductions are low due to inherent problems, such as behavioural deficiencies resulting in high post-release predation rates among captive-bred animals. In particular, the released animals may use habitats maladaptively, leading to an ecological trap, *i.e.* preference for low-quality habitats leading to reduced survival and/or breeding success. Ecological traps in reintroductions can be identified only through intensive studies of habitat preferences and survival of known individuals, but such studies are lacking. The authors investigated habitat preferences and their relationship with survival by radio-tracking reintroduced, captive-bred grey partridges *Perdix perdix*, a widely reintroduced commercial game species and native farmland bird of conservation concern in the UK. The low success rate of grey partridge releases could be due to maladaptive habitat use and a possible ecological trap. Grey partridges released as pairs in spring showed preferences for crop and field margin habitat. The use of crops had a positive, and use of field margins a negative, association with survival, suggesting field margins could serve as ecological traps for released grey partridges. Predation rates were high, and field margins probably hosted concentrated predator activity. Grey partridges released as family groups (coveys) in autumn exhibited a preference for game covers, *i.e.* areas of tall vegetation specifically planted to provide cover for game birds, and mortality rates were lower than in spring. Habitat use did not affect survival in autumn. The authors show that newly released grey partridge pairs behave maladaptively by preferring a habitat which has a negative association with survival. In grey partridge reintroductions, they recommend releasing grey partridge family groups in autumn rather than releasing pairs of birds in spring, and providing game covers that could induce the groups to settle onto the release areas. In reintroductions in general, the habitat preferences of the released animals should be documented together with their fates, to enable detection of possible ecological traps that could threaten the success of these conservation efforts.

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S Lavorel *et al.*

Using plant functional traits to understand the landscape distribution of multiple ecosystem services

Journal of Ecology 2011, 99: 135–147

Spatially explicit understanding of the delivery of multiple ecosystem services (ES) from global to local scales is currently limited. New studies analysing the simultaneous provision of multiple services at landscape scale should aid the understanding of multiple ES delivery and trade-offs to support policy, management and land planning. In this study the authors propose a new approach for the analysis, mapping and understanding of multiple ES delivery in landscapes. Spatially explicit single ES models based on plant traits and abiotic characteristics are combined to identify 'hot' and 'cold' spots of multiple ES delivery, and the land use and biotic determinants of such distributions. They demonstrate the value of this trait-based approach as compared to a pure land use approach for a pastoral landscape from the central French Alps, and highlight how it improves understanding of ecological constraints to, and opportunities for, the delivery of multiple services. Vegetative height and leaf traits such as leaf dry matter content were response traits strongly influenced by land use and abiotic environment, with follow-on effects on several ecosystem properties, and could therefore be used as functional markers of ES. Patterns of association among ES were related to the dominant traits underlying different ecosystem properties. The functional decoupling between height and leaf traits provided alternative pathways for high agronomic value, as well as determining hot and cold spots of ES. Traditional land uses such as organic fertilisation and mowing or altitude summer grazing were also linked with ES hot spots, because functional characteristics supporting fodder production and quality are compatible with species and functional diversity. Analyses of ES using plant functional variation across landscapes are a powerful approach to understanding the fundamental ecological mechanisms underlying ES provision, and trade-offs or synergies among services. Sustainable management of species and functionally diverse grassland could simultaneously aim at conserving biodiversity and locally important ES by taking advantage of correlations and trade-offs among different plant functional traits.

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PA Thomas, M El-Barghathi and A Polwart

Biological Flora of the British Isles: *Euonymus europaeus* L.

Journal of Ecology 2011, 99: 345–365

This account presents information on all aspects of the biology of spindle tree *Euonymus europaeus* that are relevant to understand its ecological characteristics and behaviour. The main topics are presented within the standard framework of the *Biological Flora of the British Isles*: distribution, habitat, communities, responses to biotic factors, responses to environment, structure and physiology, phenology, floral and seed characters, herbivores and disease, history, and conservation. *E. europaeus* is a native gynodioecious deciduous shrub whose distribution is mostly associated with fertile soil at higher pH values. It is frequently found in hedgerows and woodland edges but also in woodland as an understorey shrub, often with *Fraxinus excelsior*, *Acer campestre* and *Quercus* species, and in open scrub over limestone with *Cornus sanguinea*. Its seed is widely dispersed by birds and rodents. It is winter hardy and shade tolerant and, when young, its green shoots with stomata fix c. 15% of its CO_2. The aril is eaten by a range of animals but the seeds are poisonous and the whole plant contains compounds of medicinal and veterinary value. *E. europaeus* acts as the winter host to two important crop pests: the black bean aphid *Aphis fabae* which feeds on field beans *Vicia faba* and sugar beet *Beta vulgaris*, and the peach potato aphid/green peach aphid *Myzus persicae* a widespread pest of a large number of crops. Despite removal of *E. europaeus* from hedgerows and woodlands in the past, its present populations appear stable.

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A Grüss *et al.*
Consequences of adult and juvenile movement for marine protected areas
Biological Conservation 2011, 144: 692-702

Adult and juvenile mobility has a considerable influence on the functioning of marine protected areas. It is recognised that adult and juvenile movement reduces the core benefits of protected areas, namely protecting the full age-structure of marine populations, while at the same time perhaps improving fisheries yield over the no-reserve situation through export of individuals from protected areas. Nevertheless, the study of the consequences of movement on protected area functioning is unbalanced. Significant attention has been paid to the influence of certain movement patterns, such as diffusive movement and home ranges, while the impacts of others, such as density-dependent movements and ontogenetic migrations, have been relatively ignored. In this study the authors review the diversity of density-independent and density-dependent movement patterns, as well as what is currently known about their consequences for the conservation and fisheries effects of marine protected areas. They highlight a number of 'partially addressed' issues in marine protected area research, such as the effects of reserves targeting specific life phases, and a number of essentially unstudied issues, such as density-dependent movements, nomadism, ontogenetic migrations, behavioral polymorphism and 'dynamic' reserves that adjust location as a real-time response to habitat changes. Assessing these issues will be essential to creating effective marine protected area networks for mobile species and accurately assessing reserve impacts on these species.

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C Hambler, PA Henderson and MR Speight
Extinction rates, extinction-prone habitats, and indicator groups in Britain and at larger scales
Biological Conservation 2011, 144: 713-721

The authors present the first detailed comparison of extinction rates amongst a wide range of non-marine groups, using data from Britain. For selected taxa, comparisons are made with rates in the United States and globally. They estimate the overall extinction rate in Britain is 1-5% of the regional species list per century. Most of the groups of organisms assessed have very similar rates, with high rates in some groups which are aquatic, use deadwood or are on their climatic margin. In Britain, the extinction rate probably rose from the 19th to the 20th century, and is projected to rise in the 21st century with habitat loss being the principal driver of extinctions. In Britain, birds are relatively good indicators of extinction rates and extinction-prone habitats, whilst butterflies are not. At larger scales, such as the USA and globally, birds, freshwater fish and amphibians show potential as indicators. Consideration of 'Possibly Extinct' species and monitoring of habitat area may provide more responsive measures of biodiversity loss.

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S Giakoumi *et al.*
Designing a network of marine reserves in the Mediterranean Sea with limited socio-economic data
Biological Conservation 2011, 144: 753-763

This study is the first to determine priorities for the location of marine reserves using spatial prioritisation software in the eastern Mediterranean Sea. The authors used biophysical data from visual census surveys on: fish species abundance, presence of various habitat types, and percent coverage of seagrasses and canopy algae. Efficient conservation planning requires spatially explicit information on how proposed management will affect stakeholders, which in this region was very limited. The authors created novel socio-economic cost indices to account for fisheries and tourists. Their fishing metrics were based on fisher behaviour including information on the location of ports and areas often inaccessible to fishers due to high wind exposure. They developed a cost index for tourism based on the availability of beds for tourists and examined how the spatial priorities for marine reserves varied using different combinations of these socio-economic cost metrics. They found approximately 17% of sites were a high priority regardless of which cost metric was used. They also compared, for the first time in the Mediterranean, their results devised using systematic conservation planning approaches with priorities developed by two non-systematic methods, the Natura 2000 proposed marine reserves and sites that local fishers proposed for protection. Only a few sites identified by their approach were the same as those recommended as part of Natura 2000 or the fishers' proposals. This suggests that much more work is needed to harmonise existing proposals with the principles of efficient systematic conservation planning.

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LV García *et al.*
Protected wading bird species threaten relict centenarian cork oaks in a Mediterranean Biosphere Reserve: A conservation management conflict
Biological Conservation 2011, 144: 764-771

Conservation management conflicts frequently arise when an overpopulation of a protected organism has negative effects on other valuable elements in the same ecosystem. The authors studied the interactions between a colony of protected tree-nesting wading birds and a remnant population of centenarian cork oaks that was part of the formerly dominant forests in the Doñana Biological Reserve (SW Spain). A significant increase in the tree mortality rates has been recorded in areas that are yearly influenced by the bird colony. The authors analysed a cohort of surviving trees using a gradient of nesting bird influence. Tree-nesting history, bird isotopic signature, tree health-related parameters and several soil variables were evaluated. Bird influence was related to increased soil salinity. This increase correlated to increased water-use efficiency for the leaves and to crown defoliation, suggesting that the heavily occupied trees are under higher stress and in poorer health condition than the unoccupied ones. The authors tested structural equations models (SEM) that were based on hypothesised bird effects on the health of the trees. Soil-mediated effects of the nesting birds best explained the symptoms of the declining health of the trees, whereas the percent of leaves' surface that was covered by faeces did not improve the fitted SEM model. For the reserve's managers, a challenging trade-off exists between preserving the relict trees, which have a high genetic diversity and a key ecological role in these savannah-like ecosystems, and maintaining the current nesting area for these protected, but expanding, wading birds.

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CD Wilson, D Roberts and N Reid
Applying species distribution modelling to identify areas of high conservation value for endangered species: A case study using *Margaritifera margaritifera* (L.)
Biological Conservation 2011, 144: 821-829

The development and implementation of a population supplementation and restoration plan for any endangered species should involve an understanding of the species' habitat requirements prior to the release of any captive bred individuals. The freshwater pearl mussel *Margaritifera margaritifera* has undergone dramatic declines over the last century and is now globally endangered. In Northern Ireland, the release of captive bred individuals is being used to support wild populations and repatriate the species in areas where it once existed. The authors employed a combination of maximum entropy modelling (MAXENT) and Generalized Linear Mixed Models (GLMM) to identify ecological parameters necessary to support wild populations using GIS-based landscape scale and ground-truthed habitat scale environmental parameters. The GIS-based landscape scale model suggested that mussel occurrence was associated with altitude and soil characteristics including the carbon, clay, sand, and silt content. Notably, mussels were associated with a relatively narrow band of variance indicating that *M. margaritifera* has a highly specific landscape niche. The ground-truthed habitat scale model suggested that mussel occurrence was associated with stable consolidated

substrates, the extent of bankside trees, presence of indicative macrophyte species and fast flowing water. The authors propose a three phase conservation strategy for *M. margaritifera* identifying suitable areas within rivers that (i) have a high conservation value yet needing habitat restoration at a local level, (ii) sites for population supplementation of existing populations and (iii) sites for species reintroduction to rivers where the mussel historically occurred but is now locally extinct. A combined analytical approach including GIS-based landscape scale and ground-truthed habitat scale models provides a robust method by which suitable release sites can be identified for the population supplementation and restoration of an endangered species.

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WJ Peach *et al.*
Cereal-based wholecrop silages: A potential conservation measure for farmland birds in pastoral landscapes
Biological Conservation 2011, 144: 836-850

Declines of farmland birds have been pronounced in landscapes dominated by lowland livestock production and densities of seed-eating birds are particularly low in such areas. Modern livestock production often entails a simple cropping system dominated by ley grassland and maize grown for animal feed. These crops often lack invertebrate and seed resources for foraging birds and can be hostile nesting environments. Cereal-based wholecrop silages (CBWCS) offer potential benefits for farmland birds because they can be grown with minimal herbicide applications and can be spring-sown with following winter stubbles. The authors compared the biodiversity benefits and agronomic yields of winter-sown wheat and spring-sown barley as alternatives to grass and maize silage in intensive dairy livestock systems. Seed-eating birds foraged mainly in CBWCS fields during summer, and mainly on barley stubbles during winter and this reflected the higher densities of seed-bearing plants therein. Maize and grass fields lacked seed-bearing vegetation and were strongly avoided by most seed-eating birds. Production costs of CBWCS are similar to those of maize and lower than those of grass silage. Selective (rather than broad-spectrum) herbicide application on spring barley crops increased forb cover, reduced yields (by 11%) but caused only a small (<4%) increase in production costs. CBWCS grown with selective herbicide and with following winter stubbles offer a practical conservation measure for seed-eating farmland birds in landscapes dominated by intensively-managed grassland and maize. However, the relatively early harvesting of CBWCS could destroy a significant proportion of breeding attempts of late-nesting species like corn bunting *Emberiza calandra* or yellow wagtail *Motocilla flava*. Where late-breeding species are likely to nest in CBWCS fields, harvesting should be delayed until most nesting attempts have been completed (*e.g.* until after 1 August in southern Britain).

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D Oro *et al.*
Lessons from a failed translocation program with a seabird species: Determinants of success and conservation value
Biological Conservation 2011, 144: 851-858

Conservation diagnosis of *ex situ* techniques (*e.g.* releasing chicks by hacking) cannot be evaluated without quantitative assessment of the fate of individuals, mainly their survival and recruitment. In this study the authors use long-term monitoring at a large spatial scale of a hacking programme (*i.e.* chick translocations) for Audouin's gulls in an uninhabited site so as to establish a new breeding patch and reinforce the metapopulation. The success of the programme relied on the assumption that birds tend to recruit to the site where they fledge (*i.e.* they were philopatric). Multi-state capture-recapture models applied to a large dataset (more than 43,500 resights at 30 colonies during 1999–2010) were used to evaluate the survival of released chicks and the probability of being philopatric. Adult survival was high, but juvenile survival was lower than that of wild gulls, suggesting that there was a cost associated with hacking only during their first year of life. As expected, most released birds returned to the hacking site, but very few (including immigrants from abroad) attempted to breed there. Dispersal was inversely correlated with distance from the hacking site and positively associated with the population size of the patch (*i.e.* conspecific attraction). Even though most hacking procedures met the ecological conditions to succeed, results clearly showed that the program failed to establish a new breeding site. The ability of prospecting and the attraction made by conspecifics at established sites may be a constraint for the success of hacking programs, particularly for social and nomadic species.

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A Dutton, G Edwards-Jones, DW Macdonald
Estimating the Value of Non-Use Benefits from Small Changes in the Provision of Ecosystem Services
Conservation Biology 2010, 24: 1479–1487

The unit of trade in ecosystem services is usually the use of a proportion of the parcels of land associated with a given service. Valuing small changes in the provision of an ecosystem service presents obstacles, particularly when the service provides non-use benefits, as is the case with conservation of most plants and animals. Quantifying non-use values requires stated-preference valuations, which can provide estimates of the public's willingness to pay for a broad conservation goal. Nevertheless, stated-preference valuations can be expensive and do not produce consistent measures for varying levels of provision of a service. Additionally, the unit of trade, land use, is not always linearly related to the level of ecosystem services that the land might provide. To overcome these obstacles, the authors developed a method to estimate the value of a marginal change in the provision of a non-use ecosystem service - in this case conservation of plants or animals associated with a given land-cover type. Their method serves as a tool for calculating transferable valuations of small changes in the provision of ecosystem services relative to the existing provision. Valuation is achieved through stated-preference investigations, calculation of a unit value for a parcel of land, and the weighting of this parcel by its ability to provide the desired ecosystem service and its effect on the ability of the surrounding land parcels to provide the desired service. They used the water vole *Arvicola terrestris* as a case study to illustrate the method. The average present value of a metre of water vole habitat was estimated at £12, but the marginal value of a metre (based on their methods) could range between £0 and £40 or more.

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T Broquet *et al.*
Genetic Bottlenecks Driven by Population Disconnection
Conservation Biology 2010, 24: 1596–1605

Connectivity among populations plays a crucial role in maintaining genetic variation at a local scale, especially in small populations affected strongly by genetic drift. The negative consequences of population disconnection on allelic richness and gene diversity (heterozygosity) are well recognised and empirically established. It is not well recognised, however, that a sudden drop in local effective population size induced by such disconnection produces a temporary disequilibrium in allelic frequency distributions that is akin to the genetic signature of a demographic bottleneck. To document this effect, the authors used individual-based simulations and empirical data on allelic richness and gene diversity in six pairs of isolated versus well-connected (core) populations of European tree frogs. In their simulations, population disconnection depressed allelic richness more than heterozygosity and thus resulted in a temporary excess in gene diversity relative to mutation drift equilibrium (*i.e.* signature of a genetic bottleneck). They observed a similar excess in gene diversity in isolated populations of tree frogs. The results show that population disconnection can create a genetic bottleneck in the absence of demographic collapse.

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News in Brief

New Project to Protect Irish and Scottish Waterways

A £2.6 million project to protect the waterways of Ireland and Scotland has been launched at Queen's University Belfast. The project aims to control invasive plants, such as the giant hogweed, which are taking over river banks, destroying ecosystems, and causing health problems for those who come into contact with the aggressive plants. Invasive species are the second biggest cause of biodiversity loss worldwide and their economic impact in Europe has been estimated at over £12 billion per year, and they cost around £7.5 million to control each year in Britain alone. This EU-funded CIRB project (Controlling Priority Invasive Species and Restoring Native Biodiversity) will control invasive species (*e.g.* giant hogweed, rhododendron, Japanese knotweed and Himalayan balsam) in river catchments in border regions of Ireland (River Faughan in Co. Derry/Londonderry, Newry Canal/Clanrye River, and the Rive Dee/River Glyde in Co. Louth) and Scotland (in the Argyll, Ayrshire, Galloway and Tweed areas). The project will run until December 2014 and is part financed by the EU's European Regional Development Fund through the INTERREG IVA Cross-border Programme, managed by the Special EU Programmes Body.

Million Ponds Project Year 2 Progress Report

Pond Conservation has released the Million Ponds Project Year 2 progress report and are now at the half way point of Phase 1 of the project, which runs from 2008-2012, and are making tremendous progress throughout England and Wales. The report is available to download from www.pondconservation.org.uk/millionponds.

Boost to Great Bustard Reintroduction Programme

The Great Bustard Project, based on Salisbury Plain, has been awarded an EU LIFE+ €2.2 million grant to enlarge the project over the next five years. The project is run by a partnership of the RSPB, Great Bustard Group, University of Bath and Natural England. The grant, which will provide 75% of the project's costs, will transform the Great Bustard Reintroduction Trial (the Great Bustard Group has led the project since its inception in 2004 but has struggled to cover the costs of the project). Releasing great bustards reared from eggs rescued in southern Russia, the project had its greatest success in 2009, when the oldest males became sexually-mature and mated successfully, producing the first great bustard chicks to hatch in the wild in the UK for 177 years. An early impact of the project has been the way in which monitoring has been conducted on this year's release of great bustards - 16 of them are carrying GPS satellite transmitters.

Call for Public Participation in Irish National Frog Survey

Help is needed to report frogs and frogspawn this spring. Despite being relatively widespread in Ireland, there is growing concern about the status of frog populations, which have undergone recent declines across Europe. A survey form can be found at www.arc-trust.org/loscan. The survey will help add to a database of frog records and may fill in missing areas on the national distribution map. The results will also assist the National Parks and Wildlife Service to identify threats and assess conservation priorities, and will help ensure that frogs remain a familiar sight.

Meeting the Need for Green Skills in Europe's Job Market

For a new green economy to be successful, governments should support the development of green skills in the labour market, according to a new report entitled *Skills for Green Jobs*. This could be achieved by improving or adding to the existing core skills of workers, whilst mainstreaming environmental awareness into education and training. The new EU report explored green skills development at national, regional and local levels in six EU Member States: Denmark, Estonia, France, Germany, Spain and the UK. Both the EU and its Member States have launched economic stimulus packages for sustainable growth, which tend to focus on construction, the automotive sector, energy efficiency and renewable energy. However, there are no explicit national strategies targeting green skills in the six countries studied. Some are moving to rectify this, such as France, which has launched a mobilisation plan for green jobs. The report identifies some large weaknesses in the EU skill base, mainly in science, technology, engineering and maths (STEM), which are highly relevant to the environmental sector. However, it suggests that workers do not necessarily need to be completely retrained to create a greener industry. Instead many workers could 'top up' their existing skills and adapt them by learning about new concepts and practices in low-carbon industries. For example, workers in shipbuilding and the oil sector have skills that are relevant to the wind turbine industry, such as welding, surface treatment and outfitting skills. As well as topping up skills it is important to teach more generic skills, such as improving resource efficiency in the workplace, understanding environmental legislation and green management and communication. Download the report at: www.cedefop.europa.eu/download-manager.aspx?id=16440&lang=en&type=publication

Roosting Bats Can Adapt to Forestry Practices

A new study in *Forest Ecology and Management* shows that bats will widen their criteria for selecting roosting sites if forest management practices limit their preferred sites. However, experts recommend that small patches of old growth forest suitable for bat roosting are maintained as the bats in this study did not adapt to young woodland. The researchers studied a 100 kilometre square area in the Polish section of the Białowieza Forest. The study region included areas of well-preserved, ancient forest and other areas of younger, managed forest. The researchers used radio-transmitters to track two particular species of bats to their roosting sites in the forest. The species were the common noctule *Nyctalus noctula* and the lesser noctule *Nyctalus leisleri*. The common noctule is one of Europe's most common bat species, but the lesser noctule is relatively rare, although common in Ireland. The researchers compared the habitats around the roosting trees selected by the bats with those of all the available habitats in the same area of forest. They looked at a total of 100 roosting trees and tracked 51 bats for an average of one week each. The study shows that these particular bat species prefer to roost in deciduous woodland, characterised by a wide variety of tree species, including oak, hornbeam, and lime. Although there were some differences between the two species, both were far more likely to select old forest stands (over 100 years) as roosting sites, even though plenty of younger stands were available. However, where there was a lack of old, deciduous woodland, bats selected roosting sites in old, wet woodland instead. The study suggests that bats are able to adapt their behaviour to increase the potential area for roosting, but still avoided younger trees. The researchers therefore recommend that, in all managed forests, logging trees in patches of old growth forest should be reduced or stopped altogether in order to preserve suitable bat roosting habitats. They suggest that, where possible, these patches should be connected by corridors.

How Effective is the FSC Certification Scheme?

A recent paper in *Regulation and Governance* suggests that the Forest Stewardship Council (FSC) certification scheme has not reduced deforestation, as originally intended, but acts instead as a market governance tool, which may become a barrier to international trade. However, it may develop a conservation role in conjunction with market initiatives which value ecosystem services, such as carbon sequestration through the Clean Development Mechanism. The study looked at what influences uptake of certificates globally, using FSC, UNDP, World Bank and Food and Agriculture Organisation data on 221 countries. The paper found that a middle to high human development index is a necessary condition for certification to occur (certification may be too expensive for developing countries where there are no incentives, such as export markets). The strong link between development and certification suggests significant limitations on the role of certification as a global governance tool. Its unequal uptake may create potential problems with international trade rules and certification as a market governance tool may become a non-tariff trade barrier. Private and non-state market mechanisms are increasingly responsible for forest protection via initiatives that value externalities, such as carbon sequestration, erosion control, water regulation and social criteria, including the voluntary carbon market and the Clean Development Mechanism. These increasingly use third party certification, such as FSC, alongside other, self-regulatory certification schemes. Standards in these other certification schemes are elevated by the growth in FSC uptake and if FSC certification successfully contributes to micro-level sustainable management of forests, incentives will develop for more widespread uptake.

Monitoring the Restoration of Coastal and Estuarine Ecosystems

Restoring ecosystems in estuaries and along coasts is an important part of European environmental policy. A new analysis of degraded ecosystems in *Estuaries and Coasts* has indicated that, although some restoration can take less than five years, when there has been a century of degradation, it can take a minimum of 15-25 years. The study examined available evidence on the recovery of coastal and estuarine ecosystems as part of the EU WISER (Water bodies in Europe: Integrative Systems to assess Ecological status and Recovery) project. From a review of current studies, it identified 51 long-term cases where actions have been taken to restore ecosystems affected by human pressures and medium or long-term monitoring of recovery has occurred. The case studies were on a range of different wildlife and from different geographical regions. The study classified the 51 cases of recovery into six groups according to the type of stressor and organisms studied: recovery from changes in sediment generally caused by dredging; recovery from changes in habitat, such as marsh restoration; recovery by breaking down organic material, as in oil spills; recovery from persistent pollutants; recovery from excessive removal of wildlife, which relates to commercial fishing; and recovery from excessive extraction of water. The researchers found that the studies tend to focus on the initial reappearance of a particular form of wildlife as an indicator of restoration. However, this does not ensure that full recolonisation of all species in the habitat or a complete restoration of the ecosystem will occur. The researchers suggest that recovery initiatives require long-term goals and criteria by which to measure recovery. Both of these should include the interactive nature of ecosystems, for example, recovery should not be measured simply by the restoration of habitat or one species, but by the achieving a fully functioning ecosystem.

Intergovernmental Platform on Biodiversity and Ecosystem Services Given Green Light

The United Nations 65th General Assembly (UNGA) has agreed to establish the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) during a plenary meeting held in New York. The UNGA adoption was the final stage of approval needed to establish IPBES, and discussions on the 1st IPBES plenary have been taken further at the UNEP Governing Council meeting in February 2011. The plenary will then be organised for later in 2011. The UK will provide £2 million towards the development of the scientific body over the next four years. More information: www.ipbes.net

Call for Natural Capital to be Mainstreamed into Finance Ministries

Although the value of biodiversity and ecosystem services has been recognised, it is still not fully integrated into policy-making. A new report entitled *The GLOBE Natural Capital Action Plan* has developed a plan that recommends that governments create a 'Natural Capital' minister in the Finance Ministry, develop a set of Natural Capital Accounts and form an inter-departmental committee to oversee programmes in this area. The report argues that if the value of ecosystem services, or natural capital, is included in the overall economic equation and decision-making, governments will take better and more cost-effective decisions that respect the fundamental role that the environment plays in underpinning the economy and society's wellbeing. Building on existing knowledge, it provides a clear set of political actions to ensure the value of ecosystems is integrated into policy-making. Download the report at: www.globeinternational.info/wp-content/uploads/2010/10/Final.GLOBE-Natural-Capital-Action-Plan.pdf

Humans Increasingly Dependent on Nature

Humans are more dependent upon ecosystem services and biodiversity than ever before. A new study in *PLoS ONE* has demonstrated that human well-being derived from three major ecosystem services has been increasing in 152 countries, particularly in countries considered to be biodiversity hotspots. The study aimed to answer the question: Are humans still so dependent on ecosystems? The researchers analysed three indicators of human well-being provided by ecosystems in 152 countries. Of these countries, 92 were biodiversity hotspots and 60 were non-hotspot countries. The indicators of well-being derived from ES were: (i) production of wood; (ii) production of hydroelectricity, which depends on river flow; and (iii) investment in tourism, which depends on the cultural and aesthetic value of an area. The findings indicate that dependence of humans on cultural ES (as represented by tourism investment) has increased and is likely to increase more rapidly than dependence on ES providing regulatory functions, such as water flow (as represented by hydroelectricity). Dependence on provisioning services, such as timber (as represented by wood production), has reduced and is likely to continue to reduce. The results also indicate that humans can benefit more from ecosystems and biodiversity that are well conserved, since the overall growth of the three indicators was greater in biodiversity hotspots. Overall, the study suggests that economic growth has made humans more dependent upon ecosystems and biodiversity and this trend is most prevalent in developing countries with biodiversity hotspots. As such, these countries need to build their conservation ability and the research recommended that economic and conservation policies should be developed with the increased dependency of humans on ES in mind and the relationship of ES to economic growth. This study is free to view at: www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0013113

Ecosystem Marketplace 2010 Report

Ecosystem Marketplace has published a 2010 retrospective, looking at some of the major stories and shifts in biodiversity markets over the past year, including the CBD COP10 summit in Nagoya, the implementation of US wetland mitigation banking regulation, and a look back on the TEEB reports. Access the retrospective here: http://www.forest-trends.org/documents/newsletters/mitmail.php?newsletterID=219

Tauro-Scatology and Spending Cuts

These are troubling times for all those IEEM members who work in the public sector. It is not just the threat of job losses that worries them, but also the prospect of programmes that they have worked hard to develop, and which they believe in, being dismantled. There is only one person who can put a smile back on their faces: our very own Professor of Tauro-Scatology. Take it away, Basil...

Thank you. The first thing that might keep you all smiling is to remind you that the most preposterous of the coalition's money-saving schemes, such as the plan to sell-off our national nature reserves are already dead in the water.

But the bad news is that a coalition which thinks that such a scheme might work is seriously short of practical ecological advice in the first place, so there might be more barmy schemes just around the corner.

Exactly. So we need to be proactive in thinking up our own schemes to help them cut public spending whilst simultaneously improving service delivery...

You're talking their language now, Prof...

That's the only way. We need to be pragmatic and accept that some redundancies are inevitable, and focus on making sure that these are not at the expense of environmental protection.

So how would you do that?

Bearing in mind that redundancy can be a long, protracted process that has, itself, quite high costs associated with it, I thought of a much cheaper solution. You send an e-mail to everyone in the department, telling them to be in the foyer in 10 minutes dressed for the field. Anyone who can't get a waterproof, fleece, boots and rucksack in this time is clearly not someone who does regular fieldwork.

Your logic is that an indispensable member of a frontline environmental body doesn't spend all their time behind a desk?

Exactly. Any middle or senior manager who objects to this idea will be offered the prospect of their next operation in the NHS being performed by a surgeon who has forgotten where his surgical scrubs are kept.

Harsh but fair, Prof?

Absolutely. But, before we get carried away with this Peasant's Revolt, we must not forget the important role that middle management do actually play. If we protect frontline services...

...as current jargon would phrase it...

...we end up with lots of people who can walk the walk but fewer who have specialised in talking the talk. And, in the modern public sector, having a cadre of managers who can season even the slightest hint of environmental improvement with the latest spicy jargon is essential. How else do we persuade our Lords and Masters in Whitehall that their money is being put to good use?

So, the survivors of your ruthless cull will all be sent on motivational courses, to learn the spin doctor's dark arts?

Nothing so nefarious. Cuts in public spending could actually lead to an improvement in the state of the environment. All we need to do is give people more statistical training.

How do you mean?

Look at it like this: one of the mantras the high-ups like to recite is 'evidence-led policy'. And 'evidence' usually means quantitative data of some type. So let us assume that, even if my prescription for cutting away the flab is followed, we still find the Poor Bloody Infantry who have to collect these data being stretched to their limits. They are faced with the prospect of either monitoring fewer sites or visiting the same number of sites with a reduced frequency.

Either way this means less data, so how does this give us a better environment?

You'll probably have remembered that statistical tests tend to get more sensitive as the number of replicates per treatment increases. Student's t-test, for example, has standard error as the denominator, and standard error is standard deviation divided by the square root of sample size.

This is becoming very technical for a humorous column...

Sorry, but bear with me. The important point is that it is harder to detect a difference if we have small sample sizes. So, if we decide that the frequency of samples per site needs to be reduced in order to maintain broad geographical coverage, then it will become harder to detect a change and, therefore, harder to detect deterioration. Which means that any site presently judged to be in good condition, good status or whatever, will retain that categorisation.

That's all well and good, but doesn't the converse also apply? That it will be harder to show that a site presently judged to be failing has improved to an acceptable state?

True. Which is another reason the new breed of public sector environmental manager needs more statistical training. We'll need to make an intelligent guess about which remediation projects have the greatest chance of success, and then make sure that we direct enough resources to monitoring these sites to ensure that we can actually detect positive changes.

In other words, Prof, you are telling us to cut back on monitoring sites which presently meet their objectives, quoting financial constraints as the reason, but to bend over backwards to protect monitoring of any prestige projects where there is a reasonable chance of success.

Exactly. I call my new approach Policy-Led Evidence. It is the only way we'll guarantee funding from the new government. And do you want to know the really scary part?

Tell me.

The future is already here. I've already met one public-sector employee who has been told to stop monitoring pristine sites rather than run the risk of them failing.

Last one out, turn out the lights...

New and Prospective Members

APPLICANTS

If any existing Member has any good reason to object to someone being admitted to the Institute, especially if this relates to compliance with the *Code of Professional Conduct*, they must inform the Chief Executive Officer by telephone or letter before **10 April 2011**. Any communications will be handled discreetly. The decision on admission is usually taken by the Membership Admissions Committee under delegated authority from Council but may be taken directly by Council itself. IEEM is pleased to welcome applications for membership from the following:

APPLICATIONS FOR FULL MEMBERSHIP

Associates applying to upgrade to Full membership were listed previously for their Associate application and are not listed again.

Miss Natalie Boyle, Mr Mike Coleman, Dr Susie Coyle, Miss Laura Gravestock, Mr Trevor Hall, Mr Martin Hicks, Mrs Amanda Honeysett, Mr Paddy Jenks, Dr Jennifer Lord, Mr Richard O'Callaghan, Mr Hans-Erich Schulz, Mr Donald M Shields, Ms Erica S Sommer, Mrs Eleanor Sorfleet, Mr Philip M Stocks, Mr Roy Tapping, Ms Gilian T Taylor, Mr Neil Taylor

APPLICATIONS FOR ASSOCIATE MEMBERSHIP

Miss Joanne Balch, Miss Sarah Guest, Miss Giulietta Holly, Mrs Anne Proud, Miss Naomi R Vincent

APPLICANTS WISHING TO UPGRADE TO ASSOCIATE MEMBERSHIP

Miss Fiona Baker, Miss Lucy Blades, Miss Tanith Cook, Miss Susannah J Dickinson, Dr Jessica L Frame, Mr Jonathan Jackson, Miss Hazel Marsh, Miss Nicola Pyle, Mr Thomas Shelley, Mr Liam Soden, Miss Theresa Stewart, Mr Philip Thorpe, Mr Nicholas White, Mrs Monika Van Wyk

ADMISSIONS

IEEM is very pleased to welcome the following new members:

FULL MEMBERS

Mr Nigel Astell, Miss Katherine Birch, Miss Gemma L Bodé, Dr Ian Buchan, Ms Nina C Cornish, Miss Helen J Forster, Dr Anne F Glasspool, Dr Nicola Hall, Mr John B Harding, Mr Michael J Hattersley, Mr Kenny Kortland, Miss Kate E McNutt, Miss Julia D Morris, Mr Ian Murat, Mrs Joyce Novak-Purcell, Dr Fiona Strachan, Mr David R Warner, Miss Elizabeth Wilson

ASSOCIATE MEMBERS

Miss Elizabeth A Capps, Mr Tom Davies, Miss Bryony Gillett, Mr Neil T Monaghan, Miss Alison Reed, Miss Jenny Simcock, Miss Cassie Todd, Mr Paul Tyson

GRADUATE MEMBERS

Miss Lucy Adams, Miss Kate Bennett, Miss Victoria Burton, Mr David M Chandler, Miss Aisling M Connolly, Mr Albert E S Coules, Miss Marianne Curtis, Mr Paul L Danter, Miss Heather Dixon, Mr Martyn Drabik-Hamshare, Ms Nicole S Dunn, Miss Chloe Elding, Miss Johanna Fewtrell, Mr Benjamin Fitzgerald, Miss Zoe Greatorex, Miss Ellen C Harpham, Miss Karen Hassard, Miss Isla Hoffmann Heap, Miss Joanna Hudson, Mr Chris Jackson, Miss Kerry Leslie, Miss Katie Lloyd, Mrs Rebecca L Manning, Miss Jasmine McHugh, Miss Angela Mills, Mr Bruce Milne, Miss Cassie M Needham, Ms Heather Oaten, Mr Anthony C Owers, Mr Neil Parker, Mr Darren R Pell, Miss Victoria E Raiment, Mr Jack Rhodes, Miss Nicole Robinson, Miss Elizabeth H Ross, Mr Jamie J S Sangster, Mrs Freda M Seddon, Mr Christopher Shaw, Miss Nicola A Stanek, Miss Katy Upton, Mr Matthew P Wainhouse, Miss Stephanie R Walker, Mr Nicholas J Westerman, Miss Jennifer B Wickens, Miss Corinne Williams, Mr Douglas Williams

AFFILIATE MEMBERS

Mrs Lucinda B Butcher, Mr James A Claxton

STUDENT MEMBERS

Mrs Carol A Band, Mrs Melanie E Bennet, Miss Despina Berdeni, Miss Emily V Bloomfield, Miss Emma Bonham, Miss Ruth Bramwell, Miss Karen A Carter, Miss Gemma A Ding, Mr William J Foster, Mr Michael J Fray, Miss Alison J Gilry, Miss Sarah E Graham, Mr Tomos P L Hughes, Mr Alister Jones, Miss Jasmine S Kumadoh, Mr Ben Lawrence, Miss Kristi J Leyden, Miss Gemma Longman, Mr Tim Longstaff, Mr David Lovett, Miss Rosie McLaughlin, Mr Phil Middlehurst, Mr Nitharshan Nallasivampillai, Ms Katy S Page, Mr Edward J R Parrott, Mr James Summers, Miss Georgina P Tayler, Ms Victoria Taylor, Mr Michael Thomas, Dr Nick Underhill-Day

UPGRADES

The following have successfully upgraded their membership:

UPGRADES TO FULL MEMBERSHIP

Miss Adele Antcliff, Ms Diane Armitage, Miss Sarah Baulch, Mrs Marianne D Bergin, Mr Richard W Bickers, Mr John D Crowder, Miss Laura Davis, Miss Charlie Dwight, Miss Jessica Eades, Miss Ruth E Gregory, Miss Katrina Hoyle, Miss Carol Lodge, Mr Neil Madden, Miss Cressida Mansfield, Miss Deborah J Marchant, Mr Barry J McKenna, Mr Darryn Nash, Mr Guy Newman, Mr Simon T Parker, Mr Martin Pugh, Mrs Rebecca M Purslow, Mr Ben Ralston, Mrs Anja Randeria, Ms Rhonda Ridley, Miss Katy Robson, Dr Jenni Roche, Mr Andrew Ross, Mr Simon Thomas, Miss Jennifer Weaver, Ms Natalie White, Mr James Wrixon, Dr Catharine E Wüster

UPGRADES TO ASSOCIATE MEMBERSHIP

Miss Emily Aron, Miss Allison Austin, Miss Victoria Brooks, Mr Matthew Cook, Miss Rebecca Dale, Miss Adele Devonshire, Miss Joanne Ellam, Miss Nicola Gibson, Ms Annemarie Greenwood, Mr Andrew Halcro-Johnston, Mr Simon Holden, Miss Natalie Jones, Miss Victoria Levett, Miss Louise M Lowans, Miss Katie Mardon, Miss Anna L Maxwell, Miss Clare May, Miss Erica Mortimer, Mr Robert Nicholson, Mr Neil C Page, Mr Jonathan A Reeves, Miss Natasha J Seaward, Mrs Carol Seddon, Miss Tracy Simpson, Miss Christine Singfield, Miss Kim Wallis, Mr Luke Young

UPGRADES TO GRADUATE MEMBERSHIP

Miss Victoria A Bushell, Ms Michelle C Fielden, Dr Gwendolen E Hitchcock, Miss Rachael Iveson, Mr Markus Jaskari, Mr Jonathan E Jones, Mrs Suzanna Lockyer, Miss Bonnie McBride, Mr Kendrew McIntosh, Miss Laura A Moody, Miss Clare Parker, Mrs Ann Thornton, Miss Jenny M Wallace

Forthcoming Events

IEEM Conferences

DATE	EVENT	LOCATION
23 March 2011	Spring 2011 Conference - Invasive Species: New Natives in a Changing Climate?	London
15 June 2011	Summer 2011 Conference - Biodiversity and the Big Society	London
2 - 3 November 2011	Autumn 2011 Conference and AGM - Tools for Rebuilding Biodiversity	Liverpool

For more information on conferences please visit: www.ieem.net/conferences.asp

IEEM Training Workshops

2 April 2011	Great Crested Newt Survey and Interpretation	Brockenhurst, Hampshire
5 April 2011	Field Signs and Habitat Management for Water Voles	Lenzie, East Dunbartonshire
6 April 2011	Great Crested Newt Surveying Techniques and Assessment	Near Polegate, East Sussex
6 - 7 April 2011	Identification and Survey Techniques for Amphibians, with a Focus on Great Crested Newts	Croy, North Lanarkshire
7 April 2011	Introduction to Sand Dune Ecology and Management	Hope Park, Liverpool
12 April 2011	Introduction to Habitats Regulations Assessment	Chester, Cheshire
13 - 14 April 2011	Reptile Survey	Horndean, Hampshire
13 - 14 April 2011	Evaluation and Impact Assessment in Ecology	Chesterfield, Derbyshire
13 April 2011	Bat Basics – Where and How to Find (and Survey) Bats	Near Polegate, East Sussex
15 April 2011	GPS Field Data Collection	Cambourne, Cambridgeshire
19 April 2011	Great Crested Newt Survey and Interpretation	Selby, North Yorkshire
20 April 2011	Bat Mitigation – Licensing Development	Near Polegate, East Sussex
23 - 24 April 2010	Introduction to Bryophyte Identification for Habitat Survey	Derrygonnelly, County Fermanagh
27 April 2011	Water Vole Ecology and Conservation	Herne Bay, Kent
28 - 29 April 2011	An Introduction to Badgers and Badger Survey Techniques	Axminster, Devon
6 May 2011	Breeding Bird Survey – Habitat Management, Identification and Fieldcraft Techniques	Newtownbutler, Co. Fermanagh, N. Ireland
6 May 2011	Botany of Ancient Semi-Natural Woodlands	Dorking, Surrey
11 May 2011	Great Crested Newts - Survey and Ecology	Hoddeson, Hertfordshire
11 - 12 May 2011	Reptile Mitigation	Horndean, Hampshire
12 May 2011	Baseline Habitat Surveys	Hoddeson, Hertfordshire
12 - 13 May 2011	Introduction to Plant Identification and Phase 1 Habitat Survey	Newark, Nottinghamshire

For the full list of workshops and more information please visit: www.ieem.net/workshops.asp

IEEM Geographic Section Events

11 March 2011	South East England Section Conference and Inaugural General Meeting - Creative Conservation: Approaches to Delivering Green Infrastructure Benefits	London
23 March 2011	North East England Section Seminar - Bumblebee behaviour in agricultural landscapes	University of Sunderland
23 March 2011	North West England Section Event - Tracking Coastal Geomorphological Change: Collecting Geotemporal Data Sets in the National Parks and Wildlife Refuges in the North Eastern USA	Liverpool Hope University

For more information on IEEM Sections please visit: www.ieem.net/geographicsections.asp